Original article

The Consumption of Dietary Supplements among Gym Members in Amman, Jordan

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Abstract. *Background:* Dietary supplements (DS) are considered as a major part of many athletes' life. *Objective:* The aim of the study was to determine the prevalence of DS use among gym members in Amman, Jordan. Moreover, to determine their sources of information about DS, and assess their level of knowledge regarding the use of DS. *Methods:* A cross-sectional study was conducted using validated questionnaire among 397 gym members in the city of Amman, Jordan. The questionnaire included demographic data, use of DS, sources of information of DS, and personal knowledge and attitudes about DS. *Results:* The results of the study indicated that (146 participants, 36.8%) of participants were between 24–29 years old and that the prevalence of DS use was (70.8%) of the participants. Most of the study participants were found to obtain their information from sport coaches (37.4%), followed by nutritionist (24.2%) and health staffs (11.1%). Proteins were found to be the most single type of DS used through the users of DS (21.4 %), followed by vitamins (14.0 %). Pearson chi-square statistics revealed that gender was the only variable that make significant difference ($p<0.05$) regarding the type of DS and the source of information among users of DS. About two-third of the users of DS had sufficient information or knowledge regarding their supplements and nearly the same percentage pay attention to the nutrition facts of these supplements. Statistical analysis program SPSS (version 21) was used and statistical significance set at p-value <0.05. *Conclusion:* A large proportion of gym members in Amman use DS with a high percentage of proteins and vitamins among the most used DS. Coaches and nutritionists play a key role in counseling gym members about appropriate DS. Actually, gym members need more education programs to increase the percentage of members with high knowledge regarding DS.

Key words: prevalence, knowledge, dietary supplement, gym members

Introduction

Dietary supplements (DS) are defined as a food category that contains one or more dietary components, such as herbs, botanical components, vitamins, minerals, amino acids, and various other substances, such as metabolites and enzymes, or perhaps extracts, or a combination of any of these ingredients (1). These products are found in many forms, such as soft gels, tablets, capsules, liquid, or powder (2). They are also commercially available at stores, are ingested to increase the nutritional value in addition to the daily diet (3), and are a trendy strategy to achieve a favorable health status or specific effectiveness (4), such as for beauty purposes or for improving or maintaining health, losing weight, building muscles, preventing diseases, avoiding nutritional deficiencies, achieving body composition goals, and enhancing body function (5).

It has been observed recently that the prevalence of and social acceptance for the use of DS have significantly increased within the athlete population (6). This is achieved through marketing strategies that target a wide range of audiences and through companies that understand the power of internet influence and social media (7). These strategies particularly target those who engage in recreational activities to improve their performance and achieve faster recovery in a shorter period of

time. However, it should be noted that such marketing strategies are frequently dishonest and that many of the benefits marketed have little supporting evidence (8).

Generally, gym members are at risk when using DS, such as using supplements that contain steroids to increase their effectiveness, due to the use of various sources to obtain information regarding supplements use or obtain insufficient information about it (9). This may lead to excessive or incorrect use, as well as several adverse interactions, or the ingestion of substances that contain no active ingredients, harmful substances, or substances that contain doping agents (10). Using illicit substances is dangerous, which is why such substances should only be used under the supervision of professionals and under specific conditions (11).

Various gyms exist in Amman, Jordan, and people generally exercise to improve their performance, among other goals. Gym members use DS to improve their nutritional status. These products may contain one or more ingredients to supplement those gym members with their dietary needs (12). These individuals are considered an important target for dietary DS marketing campaigns, especially bodybuilders, because they consume more supplements (1), such as protein powder supplements containing whey protein, casein, and vegetable proteins in soy protein isolates (13). Generally, using DSs should be supervised by qualified professionals under specific circumstances (11). This is because these products have both benefits and side effects, which may adversely affect the user (14).

Knowledge regarding the use of DS in developing countries, such as Jordan, are currently lacking. This lack of information has a direct impact on athletes' health and/or performance. Therefore, considering the aforementioned aspects and the use of DS, this study is designed to measure the degree of knowledge and prevalence of DS among Jordanian gym members, as well as the purpose of using such supplements.

Materials and Methods

Research design

A quantitative cross-sectional design was used to evaluate the level of knowledge and prevalence of DS using validated questionnaire as a study tool and made a set of interviews to collect data. The researcher personally conducted all the interviews face to face with the gym members and provided them with an explanation regarding the purpose of this study. All questions were of a multiple-choice type and were candid, clear, and straightforward. The questionnaire contained a cover page that explains the aim of this research.

Questionnaire design

The questionnaire (consisted of 21 questions) was developed to collect data from gym participants about demographic data, use of DS, sources of information of DS, and personal knowledge and attitudes about DS. The questionnaire validated through face and content validity. The face validity conducted by the gym members' judgment. The content validity carried by a group of experts in sports' nutrition to explore the relevance and comprehensiveness of a questionnaire's content. Before collecting any data, a pilot study conducted with 25 gym members who gave their approval to verify the reliability (the internal consistency) of the questionnaire. The reliability measured by test-retest method with an interval of 10 days between the test application and the retest. The overall reliability value for was $r \geq 0.78$.

Population and Sample Size

The study was conducted between Jan 2021 and July 2021. The inclusion criteria for participants includes: 1) being gym member for at least 1 year; 2) no medical history for using DS as therapy; 3) and to perform on average at least two hours of training/week. To calculate the sample size, the following formula was used:

$$n = Z^2_{1-\alpha/2} P (1 - P)/e^2,$$

Where n is the number of participants, $Z^2 = (1.96)^2$ for 95% confidence, P is the "best guess" for prevalence, and e is the maximum tolerable error for the prevalence estimate. The participants were 397 gym members (295 males, 102 females); all of them met the

inclusion criteria and most of whom aged between 18 and 35. The population of this study was recruited from seven representative gyms (about 55 participants from each) in the west and east of Amman, including Zero Size Gym, Gold's Gym, Oxygen Gym, Dynamic Gym, Fitness One Vega Gym, and Fly Fitness Gym.

Procedures of Statistical Analysis

The statistical software package (SPSS; version 21, IBM, NY) was used for the analysis of data. Frequencies and percentages were calculated for the demographic variables (gender, age, marital status, Income level, and educational level). Cross-tabulation was used to differ between users and non-users of DS. Pearson Chi-square was implemented to find the relationship between the type of supplement variable and demographical variables attributed to (gender, age, marital status, Income level, and educational level) and to find the relationship between the source of information variable and demographical variables attributed to (gender, age, marital status, Income level, and educational level).

Ethical Considerations

Before the study was started, ethical approval (*Approval Number - 2705192*) was obtained from the Department of Nutrition and Food Technology of the Agriculture College, Mu'tah University, to conduct the study. Approval was also obtained from all the gym administrators to distribute the questionnaire and obtain information from volunteer gym members.

Results

Major demographic data are shown in (Table 1). Majority of the study sample were males with (74.3%) of the total sample while female's percentage was (25.7%). Most of the members of the study sample were aged between 24-29 years were (146 participants, 36.8%) of the total sample. Participants with Bachelor's degrees were (215 participants, 54.2%) of the total population which represents the higher proportion of the study sample. Most of the members were single (265 participants, 66.8%) of the total sample. Moreover, members with a moderate-income level (600-400 JD) composed the highest percentage (238 participants, 59.9%) of the total sample. The majority of the participants tend to exercise five times a week (96 participants, 24.2%).

The prevalence of using of dietary supplements among the members of the study sample was (281 participants, 70.8%), and the prevalence of non-using of dietary supplements among the members of the study sample was (29.2%) (Figure 1). In behalf of users of DS; men were three times more likely (73.3% of the users) than women (26.7% of the users) about using DS. Furthermore, the majority of the users of the DS ranged in age (24-29) with (39.9%). On the other hand, most of the supplement users among gym members had a bachelor's degree with a percentage of (52%). Also, the majority of the users of the DS were single with a percentage of (64.4%) of total users. Moreover, majority of the DS users had a moderate-income level with the percentage of (58.7%) of total users.

The DS users who asked about their sources of information answered as shown in (Table 2). Most of the DS users were found to obtain their information from sport coaches (37.4%). Also, (24.2%) were found to obtain their information from nutritionist. Moreover, (11.1%) were found to obtain their information from health staffs (i.e., doctors, pharmacists). Furthermore, there was a significant difference between the gender variable regarding source of information with ($\chi 2$) = 13.90 and p-value = 0.008.

On the other hand, DS users answered as shown in (Table 3) about their consumption pattern of DS. Regarding single type of supplements, most of the DS users were found to use proteins (21.4%), followed by vitamins (14.0 %). Meanwhile, it was found that about half of the DS users (50.1%) used more than one supplement at the same time. In contrast, (0.7%) were found to use fats and the same value for dietary fibers and both values represents the lowest percentage of DS used by DS users. Similar to the variable of information source, our results indicated that there was a significant difference between the gender variable regarding the type of supplement with ($\chi 2$) = 37.81

Table 1. Demographic characteristics and training frequency of the study sample

Variable	Categories of variable	Frequencies	Percentage
Gender	Male	295	74.3%
	Female	102	25.7%
	Total	397	100%
Age	Less than 18 year	31	7.8%
	18-23 year	96	24.2%
	24-29 year	146	36.8%
	30-35 year	111	28.0%
	Above 35 year	13	3.3%
	Total	397	100%
Education Level	High school	80	20.2%
	Diploma	63	15.9%
	Bachelors	215	54.2%
	Postgraduate	39	9.8%
	Total	397	100.0%
	High school	80	20.2%
Marital Status	Single	265	66.8%
	Married	109	27.5%
	Divorced	23	5.8%
	Total	397	100.0%
Income Level	High (More than 700 JD)	49	12.3%
	Moderate (600-400 JD)	238	59.9%
	Low (400-260 JD)	58	14.6%
	None	52	13.1%
	Total	397	100.0%
Training frequency	Daily	86	21.7%
	Twice a week	43	10.8%
	Three times a week	65	16.4%
	Four times a week	76	19.1%
	Five times a week	96	24.2%
	Six times a week	31	7.8%
	Total	**397**	100%

and *p*-value = 0.001. In behalf of the main purpose of using DS; most of the gym members (116 participants, 41.3%) use DS to be healthier, followed by desire in enhancing their performance (62 participants, 22.1%).

Results of Pearson chi-square statistics shown that there was only significant difference with (X^2) = 37.81 and *P-value* = 0.001 between gender variable and type of supplement (Figure 2). Proteins, vitamins were the most commonly used DS among males and female, respectively. The same variable also was the only one that made a significant difference with (X^2) = 13.90 and *P-value* = 0.01 regarding the source of information of DS (Figure 3). Most of the females obtained information about DS from nutritionist; with a total ratio of 31.6%. Meanwhile, most of the males obtained it from sports coaches 42.7%.

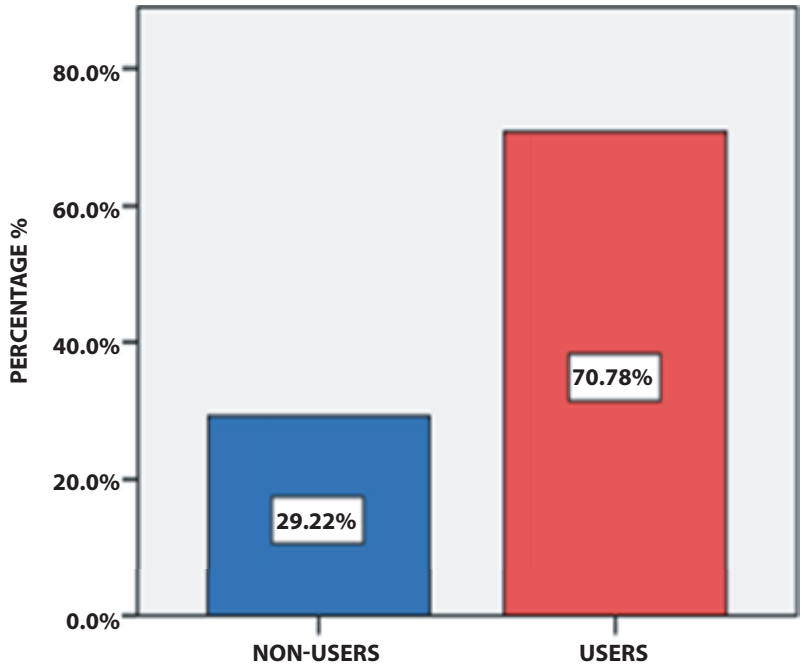

Figure 1. Prevalence of dietary supplement use among study sample (N=397)

Table 2. Source of information regarding DS among users of DS (N=281)

*Information source	Frequency	Percentage (%)
Nutritionists	70	24.2%
Health staffs (doctors, pharmacists)	32	11.1%
Sports coaches	108	37.4%
Internet and social media	37	12.8%
Family and friends	42	14.5%
Total	289	100%

**This variable allows for a multiple response*

The general attitudes towards supplements use among gym members was shown in (Table 4). Participants who use DS regularly provided were (63.3%). Furthermore, (72.2%) know what times exactly they need to take their supplements. Moreover, (69.4%) were found to have sufficient information or knowledge regarding their supplements or whether they are suitable for their type of exercise. On the other hand, (40.2%) of the participants who use DS reported that they believe there to be consequences for using supplements or that these supplements may lead to a specific disease. The largest proportion of the participants who use DS (71.2%) abided by their prescribed doses of supplements.

Results for the assessment of the level of knowledge regarding supplements use among participants who use DS were shown in (Table 5). Participants were divided into two groups with regard to the following question: "Do you believe that not abiding by the prescribed dose may cause health risks or complications?". In total, (49.5%) answered "Yes," whereas (50.5%) answered "No". Furthermore, (66.2%) of DS users reported that they pay attention to the nutrition facts label and whether this food contains hormones or not. Conversely, (33.8%) reported that they do not pay attention to the nutrition facts label. Moreover, (44.5%) agreed that if they have bad nutritional habits, supplements will be enough for them. However, (156 participants, 55.5%) did not agree about the sufficiency of supplements as an alternative for their bad nutritional habits.

Most of examined subjects showed a willingness to avoid hormone-containing DSs. Besides consulting the labels, gym members mentioned in the study interviews that many of their coaches and the nutritionist

Table 3: The usage of DS among gym members (N=281)

Variable	Categories of variable	Frequency	Percentage (%)
Type of DS	Vitamins	39	14.0%
	Minerals	4	1.4%
	Herbs	18	6.4%
	Amino acids	3	1.0%
	Proteins	60	21.4%
	Fats	2	0.7%
	CHO	8	2.9%
	Dietary fibres	2	0.7%
	Caffeine	4	1.4%
	Multiple DSs	141	50.1%
	Total	**281**	**100%**
The main purpose of using DS	To enhance weight loss	36	12.8%
	To enhance performance	62	22.1%
	To prevent injury	21	7.5%
	To be more healthy	116	41.3%
	To improve appearance	40	14.2%
	To have more muscles	6	2.1%
	Total	**281**	**100%**

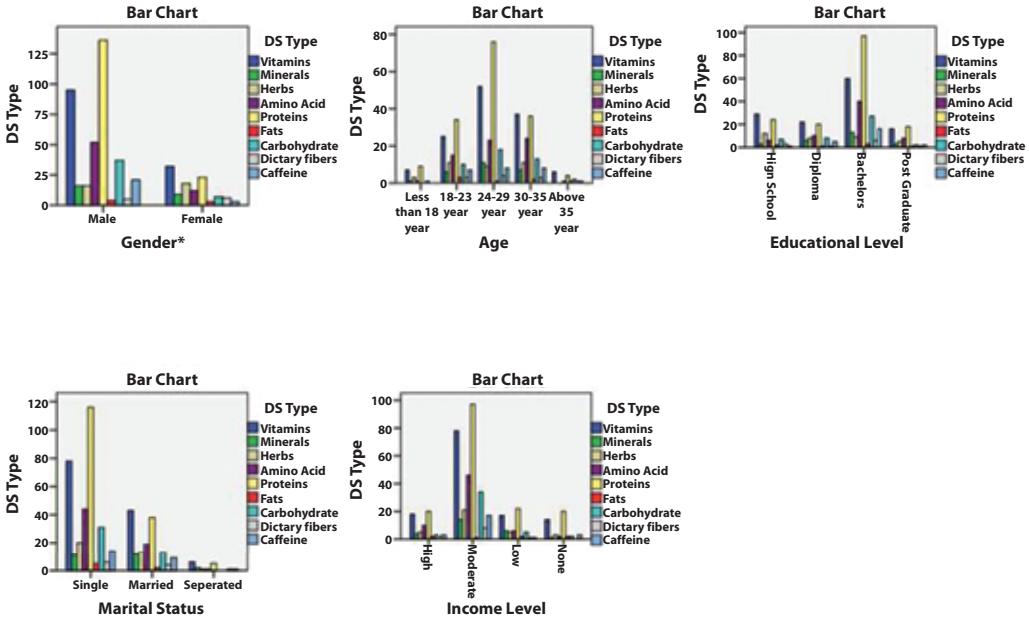

Figure 2. Relationships between DS type and demographic characteristics
**: Statistical significance at p-value < 0.05*

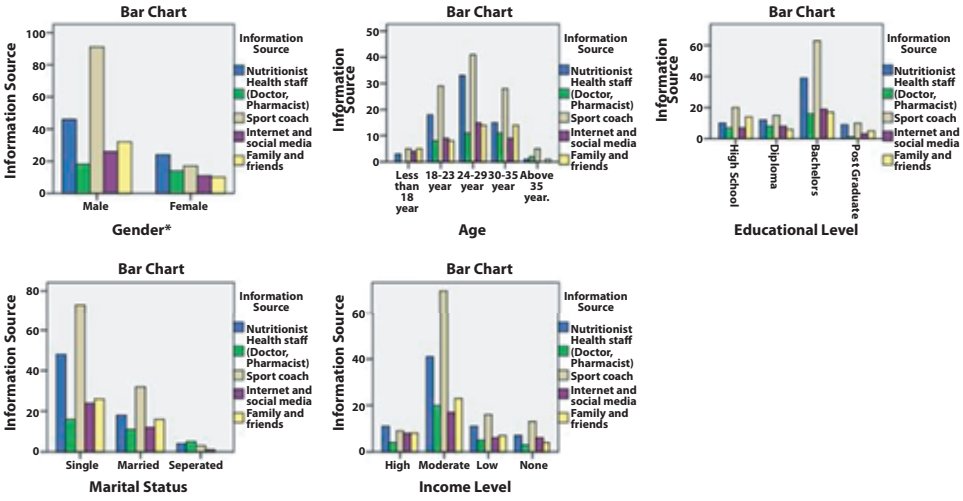

Figure 3. Relationships between information source and demographic characteristics
**: Statistical significance at p-value < 0.05*

were always give them strategies to enhance their hormones levels naturally. These strategies include, eating enough protein, avoiding sugar and refined carbs, consuming healthy fats, consuming a high-fiber diet, and avoid overeating and undereating. Moreover, gym members were recommended to increase lifestyle practices such as engaging in regular exercise, fasting intermittently, and optimizing sleep.

Discussion

Scarce data are available in Jordan regarding the prevalence and knowledge of gym members about the use of DS, as well as the kinds of products that are most commonly used. This research provides information regarding the prevalence and knowledge of DS among gym members in Amman. Moreover, the results of this research provide valuable information that can be used by experts in the fields of nutrition and sports for their research and investigations. In our study, (70.8%) of the participants were using dietary supplements. This percentage is lower that found by another study conducted in Italy which indicated that 85.4% of the participants use DS (15). In contrast, our results were higher that found by a study conducted in Portugal, which revealed that 43.8% of the gym members had used at least one dietary supplement (16). Likewise, Nieper (17) indicated that use of dietary supplements was in 62% of respondent athletes. Moreover, results of our study indicated that (37%) of DS users didn't use supplements regularly. Our result was lower than that stated by a study carried by Alfawaz et al. (18) which indicated that (66%) of gym members use supplements irregularly.

In our study, the most common type of DS used among gym members was found to be protein (21.4%). This result is in accordance with a study conducted in Taif by Abdelbaky et al. (19) which indicated that protein was the most type used with a percentage of 22.5%. In a study conducted by Goston et al. (20), there was a relationship between supplement type and gender; males used protein supplement but the females used vitamins and minerals. Such result was in agreement with our study results. Wiens et al. (21) also found that male gym members tend to consume protein powders more than females, whereas female gym members tend to use vitamin and mineral supplements. In our study, the results showed that gym members use protein supplements more than any other types of supplements. On behalf of the purpose for using DS, our results showed that the two main purposes were to improve health and performance. Later result was in accordance with results of previous studies (22, 23).

On the other hand, our results showed that most of the gym members who are users of DS, obtain their information regarding DS from sports coaches (37.4%)

Table 4. Attitudes towards supplements use among users of DS (N=281)

Do you use your supplements regularly?		
Answer	**Frequency**	**Percentage (%)**
Yes	178	63.3%
No	103	36.7%
Total	281	100%
Do you know what times exactly you need to take your supplements?		
Answer	**Frequency**	**Percentage (%)**
Yes	203	72.2%
No	78	27.8%
Total	281	100%
Do you have enough knowledge regarding your supplements and whether they are suitable for your type of exercise?		
Answer	**Frequency**	**Percentage (%)**
Yes	195	69.4%
No	86	30.6%
Total	281	100.0
Do you believe that there are consequences for using your supplements or that they may cause a specific disease?		
Answer	**Frequency**	**Percentage (%)**
Yes	113	40.2%
No	168	59.8%
Total	281	100.0
Do you abide by the prescribed dose for your supplements?		
Answer	**Frequency**	**Percentage (%)**
Yes	200	71.2%
No	81	28.8%
Total	281	100.0

Table 5. Level of knowledge regarding supplements among users of DS (N=281)

Do you believe that not abiding by the prescribed dose may cause health risks or complications?		
Answer	**Frequency**	**Percentage (%)**
Yes	139	49.5 %
No	142	50.5 %
Total	281	100 %
Do you practically pay attention to all ingredients on the nutrition facts label and the fact that this product contains no hormones?		
Answer	**Frequency**	**Percentage (%)**
Yes	186	66.2 %
No	95	33.8 %
Total	281	100 %
If you have bad nutritional habits or you do not eat well, do you believe that nutritional supplements will be enough?		
Answer	**Frequency**	**Percentage (%)**
Yes	125	44.5%
No	156	55.5%
Total	281	100%

followed by nutritionists (24.2%). Lower percentages were found to other sources such as family and friends, internet and social media, and health staffs (doctors, pharmacists). Compared to a study conducted in Switzerland, which showed that the most source of information on DS among athletes is coaches (28%), followed by supplement's website (26%); and a very small percentage obtain their information from nutritionists (24). Another study conducted by Chabaiki et al. (25) in Algeria indicated that the internet was the main source of information regarding DS use among gym members 61%. Actually, the results of our study and other previous studies alarming the need to obtain more information regarding DS from reliable sources. Most gym members don't consult nutritionists before using DS these products, making consumption uncontrolled.

The results of our study shown that (69.4%) were found to have a knowledge regarding their supplements they use. Our results are not in accordance with the study carried by Slater et al. (26) which indicated that more than (60%) had limited knowledge about the use of DS. Also, our results were in contrast to the results of a study conducted by Jovanov et al. (6), which indicated that the participants had decreased awareness regarding DS. Moreover, Chabaiki et al. (25) indicated that (61%) of supplements users showed no knowledge about the product they consumed.

Based on a study conducted by Naderi et al. (27) to provide an evidence on the timing and optimal dose of the main DS in sports nutrition, they found that the consumption of the DS are usually suggested into 5 specific times based on the type of DS. For example it is suggested to take (nitrate, caffeine, sodium

bicarbonate, carbohydrate and protein) as pre-exercise, carbohydrate (during exercise), creatine, carbohydrate, protein (post-exercise), β-alanine, creatine, sodium bicarbonate, nitrate, carbohydrate and protein (meal time) , and protein (before sleep). The recommended doses for some DS are the same regardless of body weight, although the doses of some other DS are associated with the body weight (27). In our study, (72.2%) of DS users know what times exactly they need to take their supplements. Moreover, the largest proportion of the participants who use DS (71.2 %) in our study abided by their prescribed doses of supplements. This percentage is higher than a study conducted by Dascombe et al. (28), in which only (52.4%) of the athletes consistent with the required supplement dosages.

In addition, in the present study, (66.2%) of the study sample reported that they pay attention to the nutrition facts label to know whether a product contains hormones and that they also know about their harms. However, in the study conducted by Abdelbaky et al. (19), the results showed that most of the participants were not aware of the side effects of hormones in DS. Baltazar-Martins et al. (29) indicated that four out of five of athletes that took at least one supplement, did not check safety/quality of supplements. Meanwhile, Phaladi (30) indicated that about half of the consumers were aware of the ingredients of the supplements they take.

On the other hand, Braun et al. (31) indicted that the use of dietary supplements is an indicator that they do not believe that their regular diet will be sufficient to meet their daily nutritional needs. It was found that (**44.5**%) of our study sample believed that if they have bad nutritional habits, supplements will be enough for them. Alfawaz et al. (18) stated that a small percentage of the athletes consider supplements as a substitute for a healthy diet plan. Moreover, it was found by Dascombe et al. (28), that more than half of the athletes don't need supplements with a balanced diet.

Recommendations

It is recommended that all gyms should be under the supervision of the nutritionist and gym coaches should be educated regarding dietary supplements by courses conducted by a nutritionist expert. In addition, it is recommended to conduct the study in different regions in Jordan to cover all regions. Moreover, it was found in our study that most of the members obtain information from the coaches. Therefore, it is recommended to conduct a study to assess the knowledge related to the use of DS among coaches in Jordan.

Conclusion

Our results showed that a total of 281 (70.8%) participants were consuming DS especially proteins and vitamins. Most of gym members depends on their Coaches or nutritionists as their primary source of information regarding appropriate DS. Actually, it is advised to use daily food to take nutrients that athletes need and use dietary supplements when needed with the consultation of a dietitian to prevent potential risks, complications, and negative health consequences. Moreover, there should be more education to increase awareness regarding supplementation and regarding how to choose the right supplement if needed.

Conflict of Interest: Authors declare no conflict of interest.

References

1. Attlee A, Haider A, Hassan A, Alzamil N, Hashim M, Obaid RS. Dietary supplement intake and associated factors among Gym Users in a university community. J Diet Suppl 2017;15(1): 88–97.
2. Nabuco HCG. Factoresasociados con la suplementación de la dieta entre losatletasbrasileños. Nutr Hosp 2016; 33(3): 1–8.
3. Wardenaar FC, Ceelen IJM, van Dijk JW, et al. Nutritional supplement use by Dutch elite and sub-elite athletes: Does receiving dietary counselling make a difference?. Int J Sport Nutr Exerc Metab 2017; 27(1): 32–42
4. Trakman GL, Forsyth A, Hoye R, Belski R. The nutrition for sport knowledge questionnaire (NSKQ): development and validation using classical test theory and rasch analysis. J. Int. Soc. Sports Nutr. 2017; 14(1): 1–11.
5. Kobayashi E, Sato Y, Umegaki K, Chiba T. The prevalence of dietary supplement use among college students: A Nationwide survey in Japan. Nutrients 2017; 9 (11): 1250.
6. Jovanov P, Đorđić V, Obradović B, et al. Prevalence, knowledge and attitudes towards using sports supplements among young athletes. J. Int. Soc. Sports Nutr.2019; 16(1):27.

7. Denham BE. Athlete information sources about dietary supplements: A review of extant research. Int J Sport Nutr Exerc Metab 2017; 27(4): 325–334.
8. Alfawaz H, Khan N, Almarshad A, et al. The prevalence and awareness concerning dietary supplement use among Saudi adolescents. Int. J. Environ. Res. Public Health 2020; 17(10): 3515.
9. Jawadi AH, Addar AM, Alazzam AS, et al. Prevalence of dietary supplements use among gymnasium users. J Nutr Metab 2017; 2017:9219361.
10. Roy KA, El Khoury D, Dwyer JJM, Mountjoy M. Dietary supplementation practices among varsity athletes at a Canadian university. J Diet Suppl 2021; 18(6):614-629.
11. Nabuco HCG, Rodrigues VB, Barros WM, Ravagnani FCP, Espinosan MM, Ravagnani CFC. Use of dietary supplements among Brazilian athletes. Rev. de Nutr. 2017; 30(2): 163–173.
12. Sharif SI, Mohammed A, Mohammed I, Sharif, RS. Evaluation of knowledge, attitude and use of dietary supplements among people exercising in the gym in Sharjah- United Arab Emirates. Phys Med Rehabil Res 2018; 3(5): 1–5.
13. Ronis MJJ, Pedersen KB, Watt J. Adverse effects of nutraceuticals and dietary supplements. Annu. Rev. Pharmacol. Toxicol. 2018; 58(1): 583–601.
14. Tiwari K. Supplement (mis) use in adolescents. Curr. Opin. Pediatr. 2020; 32(4): 471–475.
15. Mazzilli M, Macaluso F, Zambelli S, Picerno P, Iuliano E. The use of Dietary Supplements in fitness practitioners: A Cross-Sectional Observation Study. Int. J. Environ. Res. Public Health 2021; 18(9): 5005.
16. Ruano J, Teixeira VH. Prevalence of dietary supplement use by gym members in Portugal and associated factors. J. Int. Soc. Sports Nutr. 2020; 17:1.
17. Nieper A. Nutritional supplement practices in UK junior national track and field athletes. Br J Sports Med 2005; 39(9): 645–649
18. Alfawaz HA, Krishnaswamy S, Al-Faifi L, et al. Awareness and attitude toward use of dietary supplements and the perceived outcomes among Saudi adult male members of fitness centers in Saudi Arabia. Int J Sport Nutr Exerc Metab 2018; 28(5): 509-514.
19. Abdelbaky A, Althubaiti AA, Aloufi BA. Evaluation of knowledge, attitude and use of dietary supplement and hormones among male gym attendees in Taif City, Saudi Arabia. WFM /MEJFM 2020; 18(1): 176–186.
20. Goston JL, Correia MI. Intake of nutritional supplements among people exercising in gyms and influencing factors. Nutrition 2010; 26(6): 604–611.
21. Wiens K, Erdman KA, Stadnyk M, Parnell JA. Dietary supplement usage, motivation, and education in young Canadian athletes. Int J Sport Nutr Exerc Metab 2014; 24(6): 613–622.
22. El Khoury D, Antoine-Jonville S. Intake of Nutritional Supplements among People Exercising in Gyms in Beirut City. J Nutr Metab 2012; 2012:703490.
23. Aljaloud SO, Ibrahim SA. Use of Dietary Supplements among Professional Athletes in Saudi Arabia. J Nutr Metab 2013; 2013:245349.
24. Mettler S, Bosshard JV, Häring D, Morgan G. High prevalence of supplement intake with a concomitant low information quality among Swiss fitness center users. Nutrients 2020; 12(9): 2595.
25. Chabaiki IJ, Bekadi A, Bechikh MY. Sports supplements: use, knowledge, and risks for Algerian athletes. NAJFNR 2020; 4(7): 231–239.
26. Slater G, Tan B, Teh KC. Dietary Supplementation Practices of Singaporean Athletes. Int J Sport Nutr Exerc Metab 2003; 13(3): 320–332.
27. Naderi A, de Oliveira EP, Ziegenfuss TN, Willems MET. Timing, optimal dose and intake duration of dietary supplements with evidence-based use in sports nutrition. JENB 2016; 20(4): 1–12
28. Dascombe B, Karunaratna M, Cartoon J, Fergie B, Goodman C. Nutritional supplementation habits and perceptions of elite athletes within a state-based sporting institute. J Sci Med Sport. 2010; 13(2): 274–280.
29. Baltazar-Martins G, Brito de Souza D, Aguilar-Navarro M, Muñoz-Guerra J, Plata MdelM, Del Coso J. Prevalence and patterns of dietary supplement use in elite Spanish athletes. J. Int. Soc. Sports Nutr. 2019; 16(1): 30.
30. Phaladi, K. Use and consumer perceptions of dietary supplements in the fitness community of Gaborone, Botswana. [Unpublished master's thesis]. University of the Western Cape 2020.
31. Braun H, Koehler K, Geyer H, Kleiner J, Mester J, Schanzer W. Dietary supplement use among elite young German athletes. Int J Sport Nutr Exerc Metab 2009; 19(1): 97-109.

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