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Knowledge and Behaviors of Dietary Supplement Consumption: A Survey of Gym Attendees in Amman

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Abstract This cross-sectional study aimed to investigate the prevalence of dietary supplement consumption, levels of knowledge, and associated factors among gym attendees in Amman, Jordan. The study instrument, a self-administered questionnaire, covered sociodemographic details, exercise patterns, knowledge about supplements, and behaviours related to supplement consumption. 399 participants from 35 randomly selected gyms were surveyed, revealing that 57.6% reported using dietary supplements. Usage was higher among males (72.6%) compared to females (27.4%), with the 26-30 age group exhibiting the highest usage (43.6%) and the 41+ age group the lowest (38.8%). Supplement consumption increased with academic level and employment status, with 77.4% of university degree holders and 53.9% of employed participants reporting usage. Regarding knowledge and behaviour, 83.2% of participants demonstrated adequate knowledge about dietary supplements, while 81.2% exhibited good behaviour related to supplement consumption. Males, younger individuals, frequent exercisers, and supplement consumers were likelier to have better knowledge. Employment status and reasons for bodybuilding were associated with supplement behaviour, with employed participants and those with reasons other than athletic competition showing better behaviour. Binary logistic regression revealed that gender, age, exercise frequency, bodybuilding, BMI, and supplement consumption significantly predicted knowledge levels, while employment status, the reason for bodybuilding, and supplement consumption predicted behaviour. These findings underscore the need for targeted educational initiatives to improve knowledge and promote safe dietary supplement practices among gym attendees. Health professionals and fitness instructors should proactively provide evidence-based information and guidance regarding the selection, dosage, and potential risks associated with dietary supplements.

Keywords Knowledge, Behaviors, Dietary Supplement, Gym Attendees, Amman

1. Introduction

Proper nutrition and good dietary knowledge play a crucial role in enhancing athletes' performance [1][2]. The use of dietary supplements constitutes an independent food category, encompassing a variety of nutritional elements such as vitamins, minerals, herbs, plant-based ingredients, and amino acids [3]. There has been a significant increase in dietary supplement adoption among individuals engaged in physical activities or sports [4][5] despite the ongoing debate about their overall benefits at the population level

[6]. It is commonly recognized that physically active individuals typically do not require additional nutrients beyond those acquired from a well-balanced diet [7]. Moreover, dietary supplements should not replace regular food or be the primary component of meals [8].

Recent trends indicate a notable rise in the use of dietary supplements among gym-goers, driven by a global increase in health consciousness and the pursuit of enhanced performance and faster recovery [3], [9]. Unlike the general population, which may use supplements primarily for health maintenance [10], those frequenting gyms often target specific goals such as improving physical appearance and boosting performance. This motivation significantly differs from the more casual or health-driven consumption observed in non-athletic populations [11]. In broader terms, the efficacy of certain supplements, such as Vitamin D and folic acid, is well-documented and globally recognized, particularly for specific groups at risk of deficiencies. Vitamin D is crucial for bone health, immune function, and overall well-being, especially in individuals with limited sunlight exposure [12], while folic acid is essential for preventing neural tube defects in pregnant women [13]. These supplements are endorsed by global health organizations, affirming their role in reducing disease risk and enhancing health, thus validating their strategic use within and outside athletic contexts [14].

Motivations for using dietary supplements often include desires to reduce disease risk, enhance personal health, and prevent nutritional deficiencies [15]. Studies have suggested that individuals who use dietary supplements generally achieve higher amounts of micronutrients, vitamins, and minerals compared to those who do not [16]. Gyms have become crucial spaces for individuals to enhance their fitness and well-being [17][11]. Many believe that a regular diet might not suffice for optimal performance, leading them to supplement their nutritional intake or gain a competitive edge [9]. Gym-goers are a primary target audience for the dietary supplement market [5]. Media plays a pivotal role in influencing decisions related to dietary supplement use [18]. In addition to friends and family, media advertisements are a primary source of information for university students, with few seeking advice from doctors [19]. Easily accessible to athletes, dietary supplements have significantly shaped Middle Eastern dietary culture [18]. However, some supplements may contain excessive doses of potentially toxic ingredients, while others may lack substantial amounts of the listed ingredients [20].

The prevalence of dietary supplement use among gym-goers in Jordan is considerable. However, there is a significant gap in understanding due to the need for comprehensive scientific evidence. Despite widespread use, more empirical research is needed to elucidate the factors influencing usage patterns and associated behaviours among gym attendees in Jordan. This knowledge gap hinders the development of informed policies and interventions promoting safe and effective dietary supplement practices. Consequently, this study seeks to systematically investigate the prevalence of dietary supplement use and identify factors associated with such behaviour among gym attendees in Jordan. By doing so, the study aims to provide valuable insights into the knowledge levels and behaviours regarding dietary supplements, thereby contributing to developing evidence-based strategies to promote healthier supplement consumption practices and enhance overall well-being.

Based on the objectives outlined above, two fundamental hypotheses were formulated. The first hypothesis posits a significant variation in the knowledge and behaviours regarding dietary supplements among gym attendees in Amman, Jordan, premised on the assumption that personal health behaviours vary widely due to factors such as education and access to information. The second hypothesis suggests that demographic characteristics such as age, gender, education level, and income significantly influence this population's knowledge and behaviours related to dietary supplements. Understanding these relationships is crucial for developing targeted educational and intervention programs to promote safe and informed consumption of supplements.

2. Methods

Study Design

This cross-sectional study was conducted in Amman, Jordan, from January to June 2023. It aimed to assess the prevalence and factors associated with Anabolic-androgenic steroid (AAS) use among gym attendees. A total of 399 participants were recruited from a diverse selection of 35 out of 100 available gym facilities across the metropolitan area.

Participant Recruitment Method

Participants were recruited using a stratified cluster sampling method. Gyms were divided into strata based on gym type (CrossFit gyms and bodybuilding gyms: CrossFit gyms represented 35% of the sampled gyms, while bodybuilding gyms represented 65%) to ensure representation across different fitness settings. On randomly selected days, gym attendees were approached during their visits and invited to participate. This approach helped obtain a representative sample of gym-goers in the region. Approximately 12 individuals were targeted from each selected gym.

Ethical Considerations and Data Collection Process

Ethical approval for the study was obtained from the Ethics Committee of Al-Ahliyya Amman University, which reviewed and approved the study protocol, recruitment strategies, and informed consent forms. This

approval emphasized adherence to ethical standards such as voluntary participation, confidentiality, and the participant's right to withdraw without penalty. Participants provided informed consent before participating and completing a self-administered questionnaire that collected comprehensive data on their dietary supplement usage. This approach facilitated direct insights from the participants, enhancing the reliability and validity of the study findings. Gym administrators also granted verbal permission to effectively facilitate study participation and survey distribution. To ensure the clarity and integrity of the study, fitness centre staff were intentionally excluded from the data collection process to minimize potential confounding variables and maintain the focus of the research. Researchers were available on-site throughout the study period to address any queries or concerns from participants, ensuring a smooth and ethical data collection process. By implementing these rigorous procedures, the study aimed to elucidate the factors influencing dietary supplement usage among gym attendees, providing valuable insights into their health behaviours and consumption patterns.

Data Collection Instrument

The data collection process utilized a carefully designed questionnaire, initially developed in English and then translated into Arabic, Jordan's native language. This translation was meticulously reviewed and validated by eight experts proficient in assessment methodologies, measurement, Arabic, specialized English language skills, and nutrition. The translation process ensured cultural relevance and comprehension accuracy for the Jordanian context. The questionnaire, which drew inspiration from existing surveys and was adjusted accordingly [21], [22], [23], comprises inquiries centred around dietary supplements.

Questionnaire Structure and Design

The questionnaire was crafted drawing on existing validated surveys, with necessary adaptations to suit the specific context of dietary supplement consumption among gym attendees in Amman, Jordan. It comprised five distinct sections:

Sociodemographic Information: This section collected data on age, education, gender, and employment status.

Exercise Patterns: This section asked questions about the frequency and duration of exercise sessions, motivations for exercising, and height and weight to calculate BMI. This approach was used because participants might need to learn their BMI, making asking for height and weight measurements more practical. BMI was calculated using an Excel formula based on the height and weight provided by the participants.

Knowledge of Dietary Supplements: This questionnaire comprised five questions to evaluate the participants' understanding of dietary supplements, including their benefits, risks, and composition. The dietary supplements included in the questionnaire were specifically focused on those commonly used by athletes, such as vitamins, amino acids, and minerals. These were detailed in the respective sections of the questionnaire (see table 3).

Behavioural Patterns Regarding Supplement Consumption: It included ten questions that explored the frequency and context of dietary supplement consumption, and assessed through a four-point frequency scale labelled "Yes," "Often," "Sometimes," and "Never."

Pilot Study and Validation

Before the primary survey, a pilot study involving 30 participants was conducted to test the logistics, refine the survey instrument, and gather preliminary data. This phase was crucial in enhancing the questionnaire's robustness and ensuring its appropriateness for the more extensive study.

Response Rate and Assessment Criteria

The survey achieved a response rate of 43.3%, with 399 out of the 920 distributed questionnaires being completed and returned, indicating a solid engagement from the target population.

Assessment Criteria

Knowledge Assessment: Knowledge was evaluated based on the accuracy of answers to the knowledge-based questions. Each correct answer contributed to a higher knowledge score, quantifying the participants' understanding of dietary supplements.

Behaviour Assessment: Behaviors related to dietary supplement consumption were measured using the four-degree frequency scale, which helped categorize the respondents' usage patterns into distinct behavioural profiles, reflecting the regularity and context of their supplement consumption.

This structured questionnaire design and implementation approach ensured a comprehensive assessment of the knowledge and behaviours concerning dietary supplement consumption among gym attendees in Jordan, providing valuable insights for targeted educational and intervention programs.

Statistical Analysis

This study employed binary logistic regression analysis to determine the factors associated with knowledge and behaviour. The dependent variable was categorized into two groups to analyze knowledge about dietary supplements: poor knowledge and adequate expertise. The independent variables included in the analysis were gender, age, frequency of bodybuilding weekly, reason for bodybuilding, BMI, and supplement consumption. Odds

ratios (OR) with 95% confidence intervals (CI) were calculated to assess the strength of association between each independent variable and knowledge about dietary supplements. Regarding behaviour related to nutritional supplements, the dependent variable was dichotomized into misbehaviour and good behaviour. The independent variables analyzed included employment status, the reason for bodybuilding, and supplement consumption. Odds ratios (OR) with 95% confidence intervals (CI) were computed to evaluate the association between each independent variable and behaviour concerning dietary supplements.

3. Results

A total of 399 participants attended the gym. Among them, 57.6% reported using dietary supplements, with 72.6% male and 27.4% female respondents who consumed nutritional supplements. The 26-30 age group had the highest usage of dietary supplements at 43.6%, while the 41+ age group had the lowest usage at 38.8%.

The consumption of dietary supplements increased with academic level, with 16.1% of respondents with a high school degree and 77.4% with a university degree reporting usage. Employed participants had a higher usage rate at 53.9% compared to the unemployed (18.3%) or self-employed (18.3%), see figure 1.

Participants training for over a year and three to five times a week consumed the most supplements, 72.2% and 61.7%, respectively. Additionally, participants who aimed to improve their body appearance (21.81%) consumed more supplements than those who participated in athletic competitions or other activities.

According to the BMI index, 8.3% of underweight participants, 67.8% of healthy-weight participants, 21.3% of overweight participants, and 2.6% of obese participants consume dietary supplements. As indicated in Table 1, all variables showed significant differences in the consumption of nutritional supplements, see figure 2.

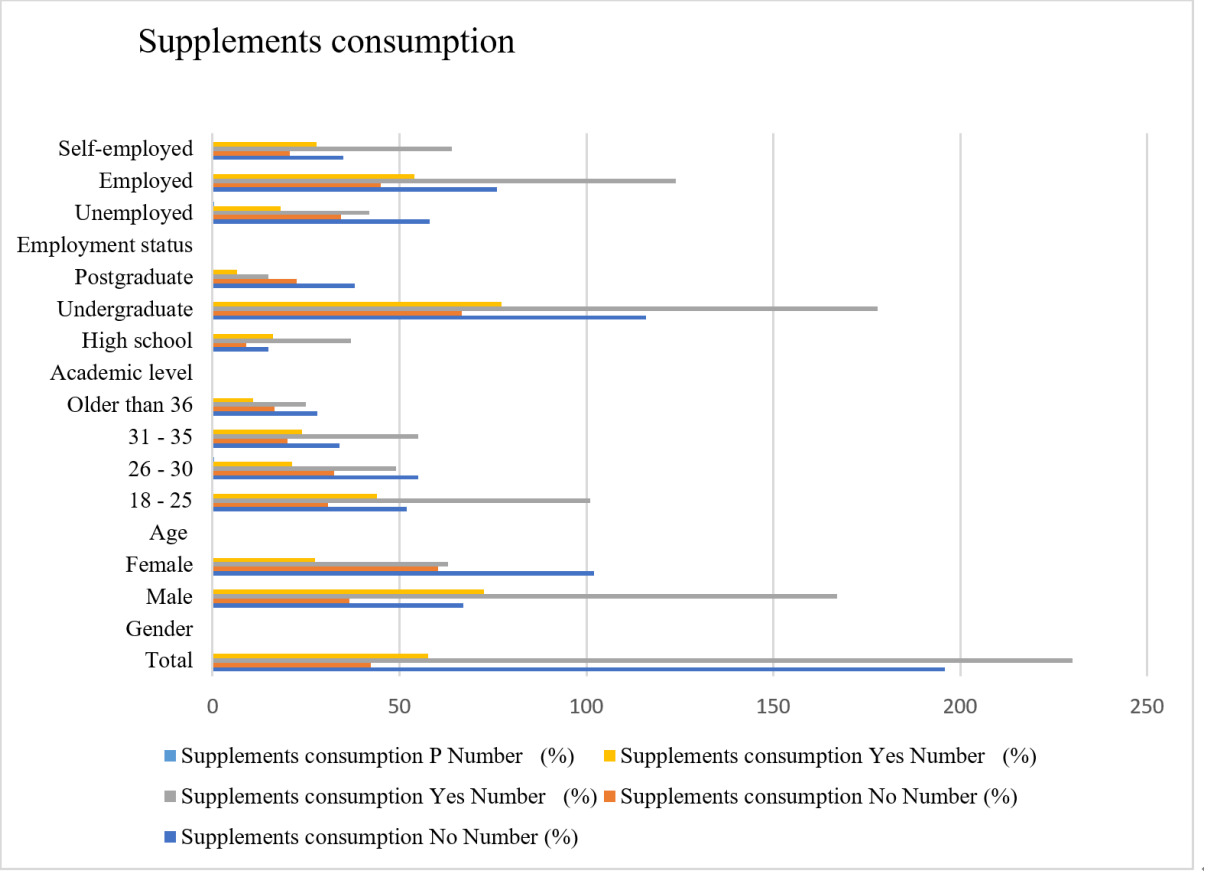

Figure 1. Demographic information of the study sample by supplement consumption (Gender, Age, Academic level, Employment status)

Table 1. Demographic information of the study sample by supplement consumption

	Supplements consumption				
Characteristics	**No**		**Yes**		**P**
	Number (%)		**Number (%)**		
Total	196	42.4	230	57.6	
Gender					
Male	67	36.6	167	72.6	0.000
Female	102	60.4	63	27.4	
Age					
18 - 25	52	30.8	101	43.9	0.003
26 - 30	55	32.5	49	21.3	
31 - 35	34	20.1	55	23.9	
Older than 36	28	16.6	25	10.9	
Academic level					
High school	15	8.9	37	16.1	0.000
Undergraduate	116	66.6	178	77.4	
Postgraduate	38	22.5	15	6.5	
Employment status					
Unemployed	58	34.3	42	18.3	0.001
Employed	76	45.0	124	53.9	
Self-employed	35	20.7	64	27.8	
Duration of Bodybuilding					
Less than a year	104	61.5	64	27.8	0.000
More than a year	65	38.5	166	72.2	
Frequency of Bodybuilding Weekly					
Less than three times	78	46.2	9	3.9	0.000
Three to five times	71	42.0	142	61.7	
More than five times	20	11.8	79	34.3	
Reason for bodybuilding					
Improve body look	83	49.1	106	46.1	0.000
Sporting competitions	15	8.9	88	38.3	
Other reasons (Psychological...)	71	42.0	36	15.7	
BMI					
Underweight range	9	5.3	19	8.3	0.001
Healthy weight	105	62.1	156	67.8	
Overweight	34	20.1	49	21.3	
Obese	21	12.4	6	2.6	

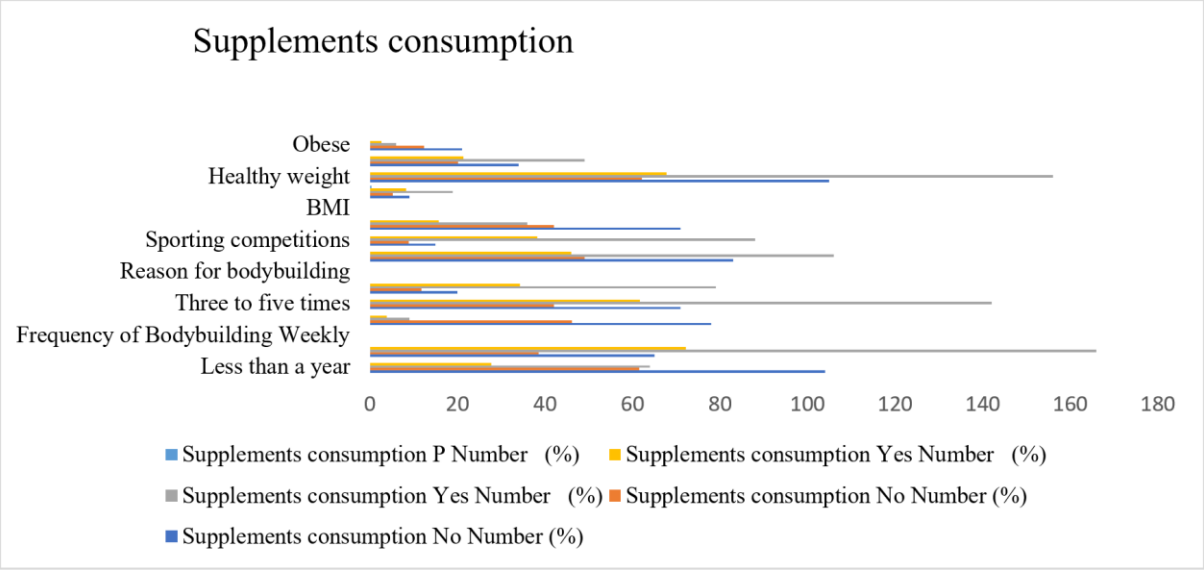

Figure 2. Demographic information of the study sample by supplement consumption (Duration of Bodybuilding, Frequency of Bodybuilding Weekly, Reason for bodybuilding, BMI)

The results showed that among the 399 participants, 332 individuals (83.2%) demonstrated adequate knowledge about dietary supplements, while 67 participants (16.8%) had poor knowledge. Regarding behaviour, 324 participants (81.2%) exhibited good behaviour related to dietary supplement consumption, while 75 participants (18.8%) displayed misbehaviour, as indicated in Table 2.

Table 2. Level of Knowledge and behaviour about Dietary supplements among gym attendees

	N (%)
Knowledge	Total score
Adequate	332(83.2)
Poor	67(16.8)
Total	399(100.0)
Behaviour	Total score
Good	324(81.2)
Mis	75(18.8)
Total	399(100.0)

Table 3 presents the average and deviation statistics for five questions measuring knowledge of nutritional supplements. The inclusion of vitamins, amino acids, and minerals in a proper diet was rated highly (M = 2.79, SD = 0.57), as was the consideration that these substances are dietary supplements (M = 2.56, SD = 0.75). On the other hand, opinions about whether dietary supplements are drugs were more divided (M = 2.47, SD = 0.81), as were views on the existence of regulation or licensing for such products in Jordan (M = 2.33, SD = 0.81). Finally, respondents had mixed knowledge about the presence of a daily dose label on dietary supplements in Jordan (M = 2.47, SD = 0.75).

Table 3 also summarizes respondents' perceptions and understanding across five key items related to dietary supplements. It reveals that a majority of respondents recognize proper nutrition including vitamins, amino acids, and minerals (86.2%), and identify these components as dietary supplements (71.2%). However, significant portions mistakenly equate dietary supplements with drugs (32.3%) and lack awareness of regulatory frameworks in Jordan, both generally (45.6%) and specifically regarding labeling requirements (37.1%). These findings underscore both strengths and gaps in public knowledge about dietary supplements, suggesting a need for targeted educational efforts to clarify misconceptions and enhance awareness of regulatory standards.

Table 3. Perceptions and Knowledge about Dietary Supplements

Item	Mean	std	Adequate	Poor
Proper nutrition includes vitamins, amino acids, and minerals.	2.79	.565	86.2%	13.8%
Vitamins, amino acids, and minerals are dietary supplements.	2.56	.748	71.2%	28.8%
Dietary supplements are drugs.	2.47	.814	67.7%	32.3%
In Jordan, there is regulation and licensing for dietary supplements.	2.33	.811	54.4%	45.6%
In Jordan, there is regulation on dietary supplements to include a label of the recommended daily dosage.	2.47	.753	62.9%	37.1%

Binary logistic regression was performed to determine factors associated with Knowledge and Behavior related to dietary supplements. The factors associated with Knowledge were Gender, age, Frequency of bodybuilding Weekly, Reason for bodybuilding, BMI, and Supplement Consumption.

Gender was a significant predictor, with males being 3.326 times more likely to know about supplements than females (OR=3.326, 95% CI=1.519-7.282, p=0.003). Age was also a significant predictor, with individuals aged 18 to 25 and 26 to 30 years being 8.505 and 19.297 times more likely to know about supplements than those aged 41 and over, respectively (OR=8.505, 95% CI=1.528-47.348, p=0.015; OR=19.297, 95% CI=2.718-37.026, p=0.003). People who exercised 3-5 times per week were 0.230 times less likely to know about dietary supplements than those who exercised more than five times per week (OR=0.230, 95% CI=0.070-0.754, p=0.015). Similarly, those who wanted to participate in athletic competitions were 0.231 times less likely to know about supplements than those with other reasons for bodybuilding (OR=0.231, 95% CI=0.070-0.763, p=0.016). Regarding BMI, those with a healthy weight were 16.244 times more likely to know about supplements than those with obesity (OR=16.244, 95% CI=4.908-53.769, p=0.000). Finally, supplement consumption was a significant predictor, with those who did not consume supplements being 0.074 times less likely to know about supplements than those who did (OR=0.074, 95% CI=0.025-0.221, p=0.000).

The factors associated with behaviour were employment status, the reason for bodybuilding, and the consumption of dietary supplements. Unemployed participants were 0.235 times less likely to engage in good supplement behaviour than self-employed participants (OR=0.235, 95% CI=0.087-0.635, p=0.004). However, employment status was not a significant predictor of supplement behaviour in employed participants (OR=0.700, 95% CI=0.295-1.663, p=0.419). Bodybuilding participants interested in athletic competitions were 0.292 times less likely to have good supplement behaviours than participants with other reasons for bodybuilding (OR=0.292, 95% CI=0.114-0.746, p=0.010). There was no significant difference between participants who engaged in bodybuilding to improve their body look and those who had other reasons (OR=1.635, 95% CI=0.793-3.369, p=0.183). Dietary supplements were a significant predictor of good behaviour towards nutritional supplements. Participants who did not consume dietary supplements were 0.095 times less likely to have good behaviour toward dietary supplements than participants who consumed nutritional supplements (OR=0.095, 95% CI=0.039-0.231, p<0.001) see Table 4.

Consistent with our first hypothesis, 83.2% of participants demonstrated adequate knowledge about dietary supplements, and 81.2% exhibited good behaviour in their consumption. These findings suggest a high level of awareness and responsible behaviour among most gym attendees, partially supporting our hypothesis that there is a significant variation in the knowledge and behaviours regarding dietary supplements in Jordan. However, the expected broad variation across different demographic groups was not as pronounced, indicating that while expertise and behaviour differ, these differences may not be as extensive as hypothesized.

In support of our second hypothesis, demographic characteristics such as age, gender, education level, and income significantly influenced this population's knowledge and behaviours related to dietary supplements. For instance, males and individuals with higher educational levels displayed better knowledge and behaviours towards supplement consumption. This aligns with the theoretical framework that suggests demographic factors play a pivotal role in shaping health-related behaviours, thereby validating the relevance of targeted educational and intervention programs.

Table 4. Factors significantly associated with knowledge and behaviour about dietary supplement

	Dependent variable			
	Poor Knowledge	**Adequate Knowledge**	**OR (95%CI)**	**P-value**
Gender				
Male	25 (10.7%)	209 (89.3%)	More likely	.003
Female (Ref)	42 (25.5%)	123 (74.5%)	1	
Age				
18 - 25	18 (11.8%)	135 (88.2%)	More likely	.015
26 - 30	12 (11.5%)	92 (88.5%)	More likely	.003
31 - 35	21 (23.6%)	68 (76.4%)	No sig. diff.	.417
36 - 40	10 (28.6%)	25 (71.4%)	No sig. diff.	.455
> 41 (Ref)	6 (33.3%)	12 (66.7%	1	
Frequency of Bodybuilding Weekly				
Less than three times	18 (20.7%)	69 (79.3%)	No sig. diff.	.801
Three to five times	40 (18.8%)	173 (81.2%)	More likely	.015
More than five times (Ref)	9 (9.1%)	90 (90.9%)	1	
Reason for bodybuilding				
Improve body look	33 (17.5%)	156 (82.5%)	No sig. diff.	.441
Sporting competitions	15 (14.6%)	88 (85.4%)	More likely	.016
Other reasons (Psychological... (Ref)	19 (17.8%)	88 (82.2%)	1	
BMI				
Underweight range	15 (53.6%)	13 (46.4%)	Less likely	.030
Healthy Weight	19 (7.3%)	242 (92.7%)	More likely)	.000
Overweight	21 (25.3%)	62 (74.7%)	No sig. diff.	.190
Obese (Ref)	12 (44.4%)	15 (55.6%)	1	
Supplement Consumption				
No	46 (27.2%)	123 (72.8%)	Less likely	.000
Yes (Ref)	21 (9.1%)	209 (90.9%)	1	
	Mis Behavior	**Good Behavior**	**OR (95%CI)**	**P-value**
Employment status				
Unemployed	31 (31.0%)	69 (69.0%)	Less likely	.004
Employed	31 (15.5%)	169 (84.5%)	No sig. diff.	.419
Self-employed (Ref)	13 (13.1%)	86 (86.9%)	1	
Reason for bodybuilding				
Improve body look	25 (13.2%)	164 (86.8%)	No sig. diff.	.183
Sporting competitions	19 (18.4%)	84 (81.6%)	More likely	.010
Other reasons (Psychological, Physical (Ref)	31 (29%)	76 (71%)	1	
Supplement Consumption				
No	56 (33.1%)	113 (66.9%)	Less likely	.000
Yes (Ref)	19 (8.3%)	211 (91.7%)	1	

4. Discussion

The objectives of this study were to establish the prevalence of dietary supplement consumption and identify associated factors among individuals attending gyms in Jordan. The findings provide valuable insights into gender disparities in knowledge and behavior regarding dietary supplements among gym attendees. Our first hypothesis posited significant variations in knowledge and behaviors regarding dietary supplements among gym attendees in Amman, Jordan. This hypothesis was confirmed by our findings, which showed notable gender differences in supplement knowledge.

Males demonstrated higher awareness and use of dietary supplements than females. Specifically, 72.6% of informed respondents were male compared to 27.4% female, indicating that males were over three times as likely to be aware of supplements. Consistent with existing research, our study indicates a higher prevalence of supplement consumption among males, particularly those frequenting gyms [8], [20], [24], [25]. Males are more inclined to consume protein supplements than females [24], often to enhance muscle mass and performance [8], [25]. Despite similar levels of supplement consumption, both genders reported comparable behaviors regarding supplement usage [24].

The study found a substantial reliance on dietary supplements among gym attendees, with a prevalence of 57.6%, significantly higher than general population estimates. This indicates targeted use for specific fitness-related goals, particularly among male gym-goers who demonstrated higher consumption rates, likely driven by the desire for muscle building and performance enhancement. This contrasts with broader usage patterns aimed at general wellness in the average population [24]. The data underscores the need for tailored educational interventions to address specific misconceptions and fill knowledge gaps [26], [27],[28]. By fostering a deeper understanding of safe and effective supplement use, fitness professionals can guide gym attendees toward more informed choices, mitigating the risks associated with unsupervised consumption prevalent in other demographic groups.

Additionally, our findings showed significant differences in supplement knowledge across age groups, particularly favoring younger individuals aged 18-25, who comprised 43.9% of respondents. Young adults in this age bracket and those aged 26 to 30 were substantially more likely to possess knowledge about dietary supplements compared to those aged 41 and over. This trend aligns with prior research suggesting that dietary supplements are commonly consumed among adults aged 18 to 34, thus contributing to the overall increase in supplement use within this age group [16].

Bell [29] reported that older adolescents with higher levels of physical activity were more likely to use certain nutritional supplements. Allen [30] also observed a higher prevalence of supplement use among females and older adults. Schroeder [31] discovered that the effects of nutritional supplements on growth varied by age, with the most significant effects observed in the first two years of life. The results showed statistically significant differences in daily dietary practices based on the age group variable [32]. These studies underscore the importance of age as a pivotal factor influencing both the utilization and effects of nutritional supplements.

The study identified statistically significant differences at the academic level variable, favoring the university stage with a percentage of 77.4% over secondary and postgraduate levels. Several studies have delved into the utilization of nutritional supplements among college students, revealing notable variations across academic levels. These studies highlight the prevalent use of nutritional supplements among students, particularly among women and those enrolled in nutritional courses [33]. Additionally, studies examined factors influencing supplement usage, indicating widespread adoption among college students, especially at the undergraduate level [34], [35]. The researchers posit that education plays a significant role in enhancing students' comprehension of nutritional supplements.

The study revealed statistically significant differences in the employment status variable, favoring employees with a percentage of 53.9% over non-employees or self-employed individuals. Participants who were unemployed were 0.235 times less likely to engage in good consummatory behavior than those who were self-employed. However, employment status did not significantly predict consummatory behavior in employed participants. Kim [36] found associations between dietary supplement use in the Korean population and older age, higher income, and participation in physical activity. This aligns with Park [37] and Lee [38], who emphasized the role of health, socioeconomic status, and education in supplement use among older adults in South Korea. Additionally, another study highlighted a potential link between physical activity and health outcomes among Korean older adults, indicating a complex interplay of factors influencing supplement usage [39].

Moreover, the study indicated statistically significant differences in the variable of the duration of bodybuilding practice, favoring individuals who had practiced the sport for more than a year, constituting 61.7% of participants, over those who practiced for less than a year. Various studies have explored the use of nutritional supplements in bodybuilding, consistently finding a significant proportion of bodybuilders utilizing them. Karimian [40] reported that 49% of bodybuilders use nutritional supplements, with men being more likely users than women. Hackett [41] observed a high prevalence (95.7%) of supplement use among competitive male bodybuilders, with creatine monohydrate and whey protein being common choices. Attlee [8] found a substantial prevalence (43.8%) of supplement use among gym users, particularly male weightlifters. Additionally,

Brill [42] noted varying supplement usage across training phases, with protein powder being more common in bulking phases and amino acids and fat burners in cutting phases. Researchers suggest that nutritional supplement usage is widespread among bodybuilders, especially among men and during specific training stages.

Our study revealed statistically significant differences in the variable of the duration of bodybuilding practice, favoring individuals who exercise 3-5 times a week, constituting 61.7% of participants, compared to those who exercise less than 3 times or more than 5 times a week. People who exercised 3-5 times a week were 0.230 times less likely to be knowledgeable about nutritional supplements than those who exercised more than 5 times a week. Research indicates an increase in the prevalence of nutritional supplement use among regular exercisers, with Attlee [8] reporting a 61.7% usage rate among individuals exercising 3-5 times per week. These findings are consistent with those of Morrison [3] and Silva [43], who found high rates of nutritional supplement usage among regular gym-goers.

Additionally, the study revealed statistically significant differences in the variable of reasons for practicing bodybuilding, favoring individuals who engage in sports to enhance their body appearance by 46.1% over those who pursue sports for competitions or other motives. Participants aspiring to participate in sports competitions were 0.231 times less likely to be knowledgeable about nutritional supplements compared to those with other bodybuilding motivations. Moreover, bodybuilding participants interested in athletic competitions were 0.292 times less likely to exhibit good complementary behaviors compared to those with different motivations for bodybuilding. Notably, there was no significant difference between participants engaging in bodybuilding to enhance their body appearance and those with alternative motivations. Karimian [44] identified men as more likely users of nutritional supplements, primarily for health benefits, immune system enhancement, and athletic performance improvement. These findings remain consistent across diverse populations, including bodybuilders, college athletes, and adults in the United States. Furthermore, the influence of coaches, nutritionists, and other experts on supplement usage is underscored [45], [46].

The study revealed statistically significant differences in the BMI variable, favoring those with a healthy weight by 67.8% over individuals who were underweight, overweight, or obese. Specifically, individuals at a healthy weight were 16.244 times more likely to be knowledgeable about nutritional supplements compared to those with obesity. Consistent research supports that individuals with a healthy weight are more inclined to use nutritional supplements compared to those who are underweight, overweight, or obese [47], [48], [49]. Furthermore, this contrasts with a study that found no statistically significant differences in knowledge levels across BMI categories [50]. This pattern is particularly noticeable among women, individuals with higher education levels, and those leading active lifestyles [47]. Additionally, users of dietary supplements often maintain a healthy diet and engage in other health-promoting behaviors [48]. Certain nutritional supplements, such as multivitamins, vitamins B6, B12, and chromium, have also been associated with weight loss in overweight and obese individuals [51]. These findings highlight the nuanced relationship between supplement use, weight status, and health behaviors.

The results indicate that out of 399 participants, 332 individuals (83.2%) demonstrated adequate knowledge about nutritional supplements, while 67 participants (16.8%) exhibited poor knowledge in this area. Supplement usage emerged as a significant predictor, with non-users being 0.074 times less likely to possess knowledge about supplements compared to users. Regarding behavior, 324 participants (81.2%) showed good behavior concerning the use of nutritional supplements, while 75 participants (18.8%) exhibited poor behavior in this regard. An essential indicator of positive behavior towards nutritional supplements was observed: participants who did not use nutritional supplements were 0.095 times less likely to exhibit good behavior towards nutritional supplements compared to those who did. Research suggests that health consciousness significantly influences attitudes towards dietary supplements [52]. However, while consumers may have adequate knowledge of food sources of nutrients, they often lack an understanding of supplement label information, particularly regarding product claims and safety testing [53]. Despite the potential benefits of nutritional supplements, their consumption may lead to decreased diet quality[49]. This underscores the importance of health professionals' knowledge and attitudes toward nutritional supplements, as they play a crucial role in counseling patients [54].

In conclusion, this comprehensive study illuminates various factors influencing knowledge about and behavior towards nutritional supplements across diverse demographic groups. Gender, age, academic level, employment status, physical activity frequency, bodybuilding practice duration, reasons for bodybuilding, and BMI all emerged as significant variables affecting participants' awareness and behavior regarding supplement use. The study identified distinct patterns: higher supplement awareness among males, younger age groups, university-level students, and individuals with a healthy weight. It also highlighted the influence of employment status, physical activity frequency, bodybuilding practice duration, and motivations for bodybuilding on supplement knowledge and behavior. These findings offer valuable insights for healthcare professionals, educators, and policymakers to develop targeted interventions aimed at enhancing supplement awareness and promoting responsible supplement use among different population segments. Furthermore, the study underscores the pivotal role of healthcare professionals in counseling patients

about nutritional supplements, emphasizing the need for ongoing education and training in this domain. Moving forward, continued research and collaboration are crucial to deepen our understanding of the intricate interplay between demographic factors, health behaviors, and supplement use. This endeavor promises to contribute to improved public health outcomes and informed decision-making regarding nutritional supplementation.

5. Conclusions

In conclusion, this study provides valuable insights into the prevalence, knowledge, attitudes, and behaviours regarding dietary supplement consumption among gym attendees in Amman, Jordan. The findings indicate a considerable usage of nutritional supplements among participants, particularly among males, younger individuals, those with higher education levels, and employed individuals. Factors such as exercise frequency, reasons for bodybuilding, and BMI were associated with knowledge levels and supplement consumption behaviours.

The study highlights the importance of targeted educational interventions to improve knowledge and promote safe supplement practices among gym-goers. By addressing knowledge gaps, targeted interventions can help enhance the overall health and performance of athletes. Health professionals, fitness instructors, and regulatory authorities play pivotal roles in providing evidence-based information, ensuring the quality and safety of dietary supplements, and implementing measures to address misperceptions and promote responsible supplement consumption behaviours.

Future research should focus on exploring the long-term effects of dietary supplement consumption, interventions to address knowledge gaps and misconceptions, and strategies to promote holistic approaches to health and fitness practices within the gym community. Collaborative efforts among stakeholders are essential to foster a culture of informed decision-making and prioritize the health and well-being of gym attendees in Jordan and beyond.

Conflict of Interest

There are no conflicts of interest to declare.

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