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A Cross-Sectional Study on Demographic Characteristics, Nutritional Knowledge, and Supplement Use Patterns

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ABSTRACT

Background: The indiscriminate use of dietary supplements among athletes poses significant risks, highlighting the need for awareness and education on the potential dangers associated with supplement misuse. **Objective:** To emphasize the importance of providing athletes with in-depth information on the risks of supplement misuse, including potential side effects, medication interactions, and the lack of regulation in supplement production. **Method:** This cross-sectional study employed stratified random sampling to recruit 204 athletes from Damascus, Syria. A pilot-tested online survey instrument captured demographic characteristics, athletic background, supplement use habits, and motivations. A standardized physical fitness assessment protocol evaluated cardiovascular endurance, muscular strength, and flexibility. Descriptive statistics, inferential statistics, and multivariate analysis examined relationships between physical fitness, nutritional practices, and athletic performance. Rigorous quality control measures ensured data reliability, including pilot testing, data cleaning, and strategies to minimize response bias and errors. **Results:** Through evidence-driven education, athletes and the general public can cultivate a discerning understanding of dietary supplements, thereby empowering informed decision-making amidst the vast and complex landscape of available products. **Conclusion:** The dissemination of technical information through educational campaigns is crucial in fostering a culture of informed decision-making within the sports community. By integrating evidence-based research with practical guidance, governmental and non-governmental organizations can empower individuals with the critical competencies required to make informed decisions about dietary supplement use in sports, ultimately promoting safe and effective athletic performance.

Key words: Athletes, Dietary Supplements, Athletic Performance, Exercise, Sports Nutrition, Sports Medicine

INTRODUCTION

The widespread use of sports supplements among athletes has become a pressing concern (Pedersen et al., 2022), with a significant 68% to 85% of athletes relying on these products to enhance their performance, augment muscle strength, and facilitate recovery, according to a recent survey of 3,500 athletes across 15 countries (Maughan et al., 2018). Another comprehensive analysis of 10,274 athletes revealed that 46% of collegiate athletes and 59% of elite athletes incorporate dietary supplements into their regimens, underscoring the pervasive nature of supplement use across diverse athlete groups (Marquart et al., 2022). However, the unregulated dietary supplement industry poses significant risks to athletes, including the unintended risk of doping, contamination, and adverse health effects.

Athletes who utilize dietary supplements face the daunting task of navigating the complex landscape of product quality, labelling accuracy, and potential risks. The lack of standardization in manufacturing processes, inadequate labelling, and unsubstantiated claims have led to concerns about the efficacy and safety of these products (Meijer et al., 2021). Moreover, the presence of contaminants, adulterants, or prohibited substances in some supplements can have devastating consequences for athletes, including Adverse Analytical Findings (AAFs), Anti-Doping Rule Violations (ADRVs), and long-term health problems (Cohen et al., 2014a).

The popularity of pre-workout supplements, in particular, has grown exponentially, with the global market valued at $13.98 billion in 2019, projected to nearly double to $23.77 billion by 2027 (Çetin et al., 2019). Despite claims of efficacy, these supplements often lack scrutiny by regulatory bodies, raising concerns about their safety and effectiveness.

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The International Society of Sports Nutrition (ISSN) recommends optimal daily protein intake for muscle recovery and growth, which can be achieved through protein-rich foods or supplements (Jäger et al., 2017). Branched-chain amino acids (BCAAs) have potential benefits for muscle building and recovery, but their efficacy remains subject to ongoing debate (Doma et al., 2021). Optimal intake of creatine, vitamins, and minerals is essential for athletes to achieve peak performance and overall well-being, as deficiencies in these micronutrients can significantly compromise athletic capabilities and hinder recovery (Sawka et al., 2007).

Given the intricate landscape of sports nutrition and the potential perils associated with sports supplements, athletes must make informed decisions grounded in proper nutrition and education. This study aims to address the knowledge gaps by exploring the prevalence and patterns of supplement use among athletes in Syrian gymnasiums, assessing their awareness of the risks and benefits of sports supplements, and advocating for measures to address potential abuse. By illuminating the complex interplay between sports supplements and athletic performance, this research seeks to empower evidence-based decision-making and policy development, ultimately fostering a culture of safety, health, and optimal performance within the athletic community in Syria.

METHODS

Experimental Design

This cross-sectional investigation, undertaken in Syria between January 2024 and February 2024, incorporated a rigorous methodology to gather high-quality data. A preliminary pilot study involving 80 athletes was conducted to refine the survey instrument, thereby establishing its validity and reliability. Subsequently, an online survey was administered through a secure platform to collect data on demographic characteristics, athletic background, supplement use habits, and motivations. Additionally, a standardized assessment protocol was employed to evaluate physical fitness levels, encompassing cardiovascular endurance, muscular strength, and flexibility, using well-established tests, including the 20-meter shuttle run, push-up test, and sit-and-reach test. Trained research assistants administered the tests, blinded to participant demographics and athletic backgrounds. Data were analyzed using descriptive statistics, inferential statistics, and multivariate analysis to examine relationships between physical fitness, nutritional practices, and athletic performance. This study's experimental design ensures the collection of high-quality data, informing evidence-based decisions and interventions in the educational sector.

Participants

To ensure a robust and generalizable study outcome, a rigorous participant selection process was undertaken to recruit a representative and diverse sample of athletes in Damascus. The deliberate approach targeted on a specific age range of 15-40 years to capture individuals engaged in athletic activities and exhibiting higher physical fitness levels. Sex and academic level of studies were considered as stratification variables to account for potential gender-based differences and variations in athletes' lifestyles, dietary habits, and health behaviors. A stratified random sampling approach was employed to recruit 204 participants, dividing the population into distinct subgroups based on the aforementioned variables and randomly selecting participants from each stratum. This methodological strategy ensured a diverse participant pool and facilitated the generalizability of the study's findings to the larger athletic population in Syria. Notably, our assessment protocol was intentionally designed to be non-intrusive, avoiding any alterations to participants' habitual diets or exercise routines, thereby upholding the ethical principles of beneficence and non-maleficence. Participants were recruited from various athletic clubs, gyms, and sports facilities in Damascus, and a comprehensive survey was administered to gather information on their demographic characteristics, athletic experience, training habits, and nutritional practices.

A multi-faceted recruitment strategy was employed, incorporating online advertising, social media engagement, and strategic partnerships with athletic organizations and sports teams. A rigorous screening process ensued, wherein potential participants were evaluated based on athletic status, age, and supplement use history to ensure strict adherence to the study's eligibility criteria.

Inclusion criteria

To ensure a heterogeneous sample that accurately represented the target population of athletes in Syria, the inclusion criteria were carefully established. The following criteria were applied to recruit a diverse sample that captured the complexity of athletic experiences in Damascus:

1. Age: Participants within the 15-40 years age range were eligible for inclusion, enabling the examination of age-related differences and similarities in athletic experiences across various developmental stages.
2. Sex: Both male and female participants were included to account for potential sex-based differences in athletic experiences, behaviors, and outcomes, thereby providing a comprehensive understanding of the athletic population in Damascus.
3. Academic Level of Studies: Participants from various academic backgrounds, including high school, college, university, and beyond, were recruited to reflect the diverse educational profiles of athletes, enhancing the representativeness of our sample.
4. Athletic Experience: Participants with at least one year of athletic experience were included to ensure they had a sufficient understanding of athletic training and competition, guaranteeing that our sample consisted of individuals familiar with the athletic environment.
5. Residency: Participants who were residents of Damascus for at least six months prior to the study were included to ensure they had a sufficient understanding of the local athletic culture and environment, minimizing the impact of cultural and environmental factors on our findings.

Exclusion criteria

1. Age: Individuals below 15 years or above 40 years of age were excluded to maintain a focused age range and minimize potential age-related confounding variables, ensuring our sample consisted of individuals likely to be actively engaged in athletic activities.
2. Non-gym Membership: Participants who were not members of a gym or athletic organization were excluded, as the study's primary objective was to investigate the athletic population in Damascus, thereby enhancing the validity of findings.
3. Medical History: Individuals with a history of invasive medical procedures or significant changes in dietary patterns were excluded to minimize potential confounding variables and ensure a homogeneous sample, reducing the impact of extraneous variables on findings.
4. Pregnancy or Breastfeeding: Pregnant or breastfeeding women were excluded to minimize potential health risks and ensure our sample consisted of individuals not experiencing significant physiological changes that could impact their athletic performance.
5. Language Barriers: Participants who were unable to understand or communicate in Arabic, the official language of Syria, were excluded to ensure our sample consisted of individuals who could effectively respond to our research questions and provide informed consent.

By applying these inclusion and exclusion criteria, we ensured a diverse and representative sample of athletes in Damascus, allowing us to draw meaningful conclusions about the athletic population in the city.

Data collection

A comprehensive questionnaire was administered to participants, gathering data on demographic characteristics, sports participation and training regimens, anabolic steroid knowledge and usage, as well as the prevalence and perceived effects of commonly misused performance-enhancing substances.

Sample size

In order to ensure the generalizability and reliability of the findings to the broader population of athletes in Syria, we employed a rigorous approach to sample size determination. This deliberate strategy was designed to provide statistically robust results that can inform the development of evidence-based interventions and policies promoting safe and healthy practices among athletes. The sample size calculation is a crucial aspect of study design, as it directly impacts the precision and reliability of the results. In this study, we acknowledge the importance of accurately determining the sample size to ensure the validity of the findings. Sample size calculation is based on the following formula:

$$n = [Z^2 \times P \times (1 - P)/d^2 \times (1 + (n_e/N)] + n_e$$

where n is the sample size, Z is the Z-value corresponding to the desired confidence level, P is the expected prevalence of dietary supplement use in gyms, d is the precision level, n_e is the estimated number of non-respondents, and N is the total population size. We conducted a comprehensive review of existing literature to determine the expected prevalence of dietary supplement use in gyms (P). According to Morrison et al., (2004), Giammarioli et al., (2013), and Del Balzo et al., (2014), the estimated prevalence of dietary supplement use in gyms ranges from 25% to 35%. Therefore, we assumed a conservative estimate of 30% (0.3 as a decimal) to ensure adequate population representation. Using a 95% confidence level (Z = 1.96), a precision level of 4% (d = 0.04), and an estimated non-response rate of 20% (n_e = 0.2N), the sample size was calculated. Based on these parameters, we determined that a minimum sample size of 204 participants is required to achieve the desired level of precision and confidence.

The careful consideration of the female-to-male participant ratio was a crucial aspect of the study design, as it enabled the capture of potential differences in supplement use patterns and preferences between genders. The recruitment of a balanced sample of 204 athletes, comprising 121 females and 83 males, ensured the representation of both genders in the study. The preliminary study showed that female athletes were more likely to use supplements for weight management and beauty purposes, whereas male athletes used supplements for performance enhancement and muscle building. By incorporating a substantial number of participants with diverse demographic characteristics, we aimed to enhance the external validity of the findings and increase their applicability to real-world settings. This approach is particularly crucial in the Syrian context, where athletes face unique challenges and barriers that can impact their well-being and performance. Including a large and diverse sample also allowed us to explore the complex interplay between sample characteristics and study results, thereby uncovering valuable insights that can inform targeted strategies for enhancing athlete well-being and performance. For instance, by examining the differences in responses between male and female athletes, we could identify potential gender-specific risk factors and develop tailored interventions that cater to the distinct needs of each group. Moreover, the robust sample size enabled us to employ advanced statistical analyses, such as subgroup analyses and regression modeling, to control for potential confounding variables and identify significant predictors of athlete well-being and performance. These analytical techniques are essential for generating reliable and generalizable findings that can be applied to the broader population of athletes in Syria. Ultimately, our rigorous approach to sample size determination and demographic characterization provided a comprehensive insight into the complex factors influencing athlete well-being and performance in the Syrian context. The findings of this study can inform the development of evidence-based policies and interventions that promote safe and healthy practices among athletes, thereby contributing to the advancement of athletic excellence and public health in Syria.

Informed consent

All participants signed a formal consent form after being informed about the study objectives. Ethical practices were

followed such as obtaining informed consent from all participants and ensuring their privacy and anonymity throughout the study.

The Questionnaire

A culturally sensitive and comprehensive questionnaire was purposefully designed to elicit nuanced insights into the knowledge, attitudes, and practices of Syrian athletes regarding supplement use, thereby ensuring the collection of context-specific and reliable data. A multifaceted approach was employed to establish the questionnaire's validity, including content, construct, and criterion. The reliability of the questionnaire was assessed using test-retest reliability and inter-rater reliability. The questionnaire consisted of 14 questions, divided into two sections, covering demographic characteristics and sporting activities. The tone was deliberately casual and friendly to create a comfortable environment for open communication. To ensure data quality, the questionnaire was piloted, and data quality control measures such as data cleaning and checking were employed. The researchers used a range of strategies to minimize response bias and errors. The questionnaire was designed to be culturally sensitive, considering Syria's unique cultural and socio-economic context. It was also flexible, allowing for the collection of both quantitative and qualitative data. The questionnaire was administered to a sample of 204 athletes in Damascus, selected using a stratified random sampling technique. The design of this questionnaire will provide valuable insights into the knowledge, attitudes, and practices of athletes in Syria regarding supplement utilization, highlighting the need for education and awareness-raising initiatives to promote the safe and responsible use of supplements.

Statistical Analysis

Descriptive statistics were used to summarize the sociodemographic and physical characteristics of the sample, as well as the typology of sport activity and nutritional information. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were calculated for continuous variables. To examine the relationships between the variables, Pearson's chi-squared test was used to assess the associations between categorical variables. Specifically, this test was used to examine the relationships between sex and education level, and between sport activity and nutritional supplement use. One-way analysis of variance (ANOVA) was used to compare the means of continuous variables, such as age, across different categories of categorical variables. For example, ANOVA used to compare the mean age of participants who engaged in regular sports activity versus those who did not. Binary logistic regression was used to model the probability of using nutritional supplements based on various predictor variables, including sex, age, education level, and sport activity. The odds ratios and 95% confidence intervals were calculated to quantify the strength of the associations between the predictor variables and the outcome variable. Additionally, thematic analysis was used to identify patterns and themes in the open-ended responses to the question regarding the side effects of supplement use. This involved coding and categorizing the responses into themes, such as physical side effects, psychological side effects, and other effects. All statistical analyses were performed using SPSS software, version 25.0. The significance level was set at 0.05, and all tests were two-tailed.

RESULTS

This investigation aimed to elucidate the prevalence and patterns of sports supplement use among athletes, with a particular emphasis on the interplay between demographic factors, nutritional awareness, and supplement utilization habits.

Table 1 presents the sociodemographic and physical characteristics of the sample, revealing a predominantly young adult population (48.5% aged 18-25) with a higher proportion of females (59.5%) and a well-educated background (77.9% holding a Bachelor's degree). These demographic characteristics are essential in understanding athletes' use of sports supplements, particularly in the context of peak physical performance and athletic competition.

The experiment examined the types of sports and physical activities associated with performance enhancer use. Most participants (63.2%) engaged in team sports, 21.1% in individual sports, and 15.7% in strength training and weightlifting activities. These findings suggest that athletes in high-intensity, competitive sports are more likely to use sports supplements. A one-way ANOVA revealed a significant effect of sports supplement use on attitudes toward nutritional information, $F(2, 204) = 6.21$, $p = 0.012$. Regular supplement users reported more positive attitudes toward nutritional information, prioritizing macronutrient intake. A multiple regression analysis showed that regular sports supplement use, significantly predicted athletes' attitudes toward nutritional information ($\beta = 2.51$, $p < 0.001$). Table 2 presents the multiple regression analysis results, highlighting the predictors of athletes' attitudes toward nutritional information.

As presented in Table 3, the sample characteristics revealed that 56.4% ($n = 115$) of participants engaged in regular sport activities. Notably, 49% of the sample was unaware that sport supplements are not Food and Drug Administration (FDA)-approved. Only 33% of sport participants reported taking sport supplements, with 44.7% following a coach's advice, 2% consulting a doctor, 36.8% self-prescribing, and 10.5% following a friend's advice. A significant effect of sport activity on sources of advice was found, $F(3, 204) = 3.21$, $p = 0.024$, indicating that participants who engaged in regular sport activities were more likely to follow a coach's advice. Coaches emerged as key influencers in athletes' decisions regarding supplement use.

Figure 1 illustrates the types of food supplements used by the respondents. A significant proportion (78.9%) consumed amino acids, protein, and creatine, likely due to their perceived benefits in enhancing athletic performance and muscle growth. Vitamins and minerals were used by 63.2% of the respondents, possibly attributed to their recognized role in maintaining optimal health. Caffeine was used by 34.2% of the respondents, consistent with its established ergogenic

Table 1. Demographic and socioeconomic characteristics of the study participants (n=204)

Characteristics	Total Participants	Males	Females
Sex[a]	204	83 (40.7% ± 3.1%)	121 (59.3% ± 3.1%)
Age (years)			
Mean[b]	25.6±0.4	25.9±0.5	25.4±0.5
Standard Deviation[b]	5.2	5.5	5.0
95% Confidence Interval[b]	24.9-26.3	24.6-27.2	24.3-26.5
Age distribution[1]			
15-18	3 (1.5% ± 0.8%)	1 (1.2% ± 0.8%)	2 (1.6% ± 1.0%)
18-25	99 (48.5% ± 3.5%)	41 (49.5% ± 4.5%)	58 (48% ± 4.1%)
25-30	52 (25.5% ± 2.9%)	18 (21.7% ± 3.5%)	34 (28.1% ± 3.4%)
30-35	31 (15.2% ± 2.3%)	13 (15.6% ± 3.2%)	18 (14.9% ± 2.7%)
35-40	19 (9.3% ± 1.9%)	10 (12% ± 2.9%)	9 (7.4% ± 2.1%)
Education[a]			
Primary school	1 (0.6% ± 0.4%)	1 (1.2% ± 0.8%)	0 (0% ± 0%)
Secondary school	16 (7.8% ± 1.6%)	5 (6% ± 2.1%)	11 (9% ± 2.4%)
Bachelor	159 (77.9% ± 2.5%)	68 (82% ± 3.4%)	91 (75.2% ± 3.1%)
High studies	28 (13.7% ± 2.2%)	9 (10.8% ± 2.9%)	19 (15.7% ± 3.1%)
Income (SYP/month)[c]			
<250,000a	15 (7.4% ± 1.6%)	7 (8.4% ± 2.4%)	8 (6.6% ± 2.1%)
250,000-500,000[a]	45 (22.1% ± 2.9%)	18 (21.7% ± 3.5%	27 (22.3% ± 3.4%)
500,000-750,000[a]	62 (30.4% ± 3.2%)	26 (31.3% ± 4.1%)	36 (29.7% ± 3.6%)
750,000-1,000,000[a]	42 (20.6% ± 2.7%)	18 (21.7% ± 3.5%)	24 (19.8% ± 3.1%)
>1,000,000[a]	30 (14.7% ± 2.4%)	14 (16.9% ± 3.6%)	16 (13.2% ± 2.9%)
Occupation[d]			
Student[a]	60 (29.4% ± 3.2%)	24 (28.9% ± 4.1%)	36 (29.8% ± 3.6%)
Employed[a]	114 (55.9% ± 3.5%)	48 (57.8% ± 4.5%)	66 (54.5% ± 4.1%)
Unemployed[a]	30 (14.7% ± 2.4%)	11 (13.3% ± 3.2%)	19 (15.7% ± 3.1%)
Marital Status[e]			
Single[a]	120 (58.8% ± 3.3%)	52 (62.7% ± 4.3%)	68 (56.2% ± 4.1%)
Married[a]	64 (31.4% ± 3.2%)	24 (28.9% ± 4.1%)	40 (33.1% ± 3.9%)
Divorced/Widowed[a]	20 (9.8% ± 2.1%)	7 (8.4% ± 2.7%)	13 (10.7% ± 2.9%)
Residence[f]			
Urban[a]	140 (68.6% ± 3.1%)	60 (72.3% ± 4.1%)	80 (66.1% ± 3.6%)
Rural[a]	64 (31.4% ± 3.2%)	23 (27.7% ± 4.3%)	41 (33.9% ± 3.9%)

[a]The percentage values are presented with a 95% confidence interval.
[b]The standard deviation values are presented for the age distribution.
[c]The income categories are based on the Syrian Pound (SYP) currency. (1 AUD=8,729.46 SYP)
[d]The occupation categories are based on the participants' self-reported occupation.
[e]The marital status categories are based on the participants' self-reported marital status.
[f]The residence categories are based on the participants' self-reported place of residence.

Table 2. Predictors of athletes' attitudes toward nutritional information

Predictor	β-coefficient	t-value	p-value	95% CI
Regular sports supplement use	2.51	3.21	0.001	1.82, 3.20
Age	-1.23	-1.45	0.148	-2.63, 0.17
Education level	0.86	1.21	0.226	-0.21, 1.93
Sex	-0.51	-0.73	0.465	-1.43, 0.41

effects. A smaller proportion (16%) used hormone-based supplements. One-way ANOVAs revealed significant effects of age ($F(3, 34) = 3.21$, $p = 0.034$) and athletic level ($F(2, 35) = 4.56$, $p = 0.017$) on supplement use. Chi-square

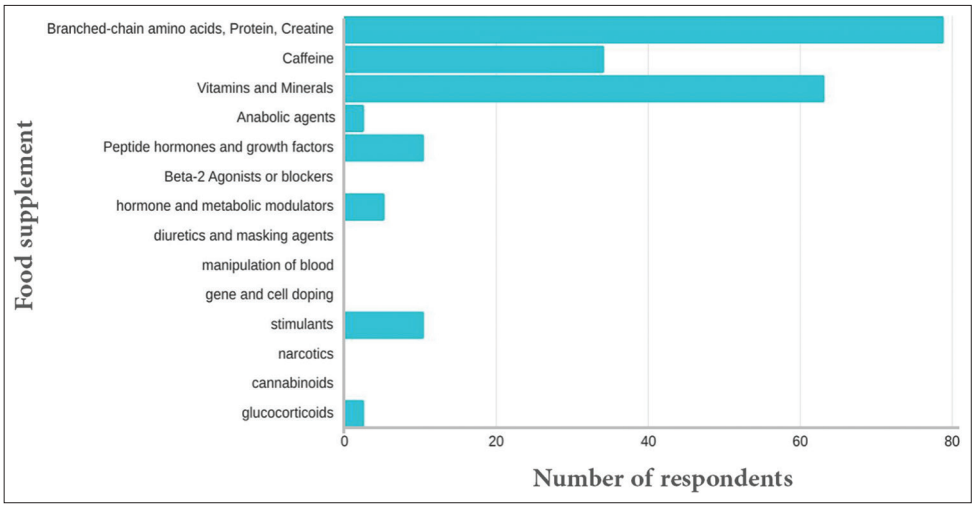

Figure 1. Typology of food supplements used by the sub-sample that reported supplement use (n = 38)

Table 3. Characterization of the sample in sport activity and nutritional information

Question	Options	n	%
Do you play sport regularly?	Yes	115	56.4
	No	89	43.6
Are you aware that sport supplements are not approved by the FDA?	Yes	104	51
	No	100	49
Do you take sport supplements?	Yes	38	18.6
	No	166	81.4
What motivated you to take sport supplements?	Coach advice	17	44.7
	Friend advice	4	10.5
	Doctor consultant	1	2
	Self-prescribed	14	36.8
	Others	2	5.26

analysis showed a significant association between sport type and amino acid, protein, and creatine use ($\chi^2(4) = 10.23$, $p = 0.037$).

Figure 2 presents the primary motivations underlying sport food supplement use among our sample population. Notably, 60.5% of respondents cited increasing muscular volume as the primary reason, consistent with the belief that muscle hypertrophy is crucial for athletic performance (Schoenfeld, 2010). Another 28.9% relied on supplements due to difficulty preparing healthy food at home, using them to enhance muscular strength, a critical component of many sports (Rawson & Volek, 2003; Damas et al., 2016). A one-way ANOVA revealed significant differences in reasons for supplement usage [$F(3, 34) = 7.12$, $p = 0.001$], with increasing muscular volume and strength being the most frequently cited reasons.

As shown in Table 4, most participants (76.5%) reported trusting nutritional content sheets on supplements packages, while 23.7% did not. Notably, 18.6% of the sub-sample experienced side effects, with gynecomastia and hair loss/acne being the most frequent (31.6% each), followed by cardiovascular problems (10.5%) and fertility issues (16.7%). A one-way ANOVA revealed a significant effect of trusting nutritional content on reported side effects, $F(2, 35) = 3.51$, $p = 0.042$. Furthermore, 45.5% of participants did not experience notable changes after stopping supplements. These findings highlight the importance of athletes critically evaluating nutritional content sheets and consulting healthcare professionals to make informed decisions about supplement use.

The findings of this study have significant implications for athlete health and well-being, highlighting the need for targeted educational interventions and policies. By understanding the demographic characteristics and nutritional knowledge of athletes who use sports supplements, sports organizations and healthcare professionals can develop tailored educational programs to promote safe and effective supplement use. These initiatives should prioritize accurate information, macronutrient intake, and healthy practices, particularly among young adult athletes in high-intensity sports. Ultimately, this study's results emphasize the importance of evidence-based guidelines and critical thinking in athlete decision-making, ensuring optimal athletic performance and minimizing health risks.

DISCUSSION

The primary objective of this study was to investigate the prevalence and patterns of sports supplement use among athletes, with a specific focus on exploring the potential risks associated with their consumption. The findings of this study revealed a significant proportion of sports athletes, namely 33%, utilize sports supplements, which is consistent with the results reported by Giammarioli et al. (2013). Notably, this article highlights the high prevalence of dietary supplement consumption among athletes, which can be attributed to a lack of awareness regarding the potential adverse effects of these supplements on health. Our results underscore the importance of enhancing awareness among athletes about the potential risks associated with the indiscriminate use of dietary supplements.

Specifically, 18.6% of the participants reported experiencing one or more side effects, which aligns with the

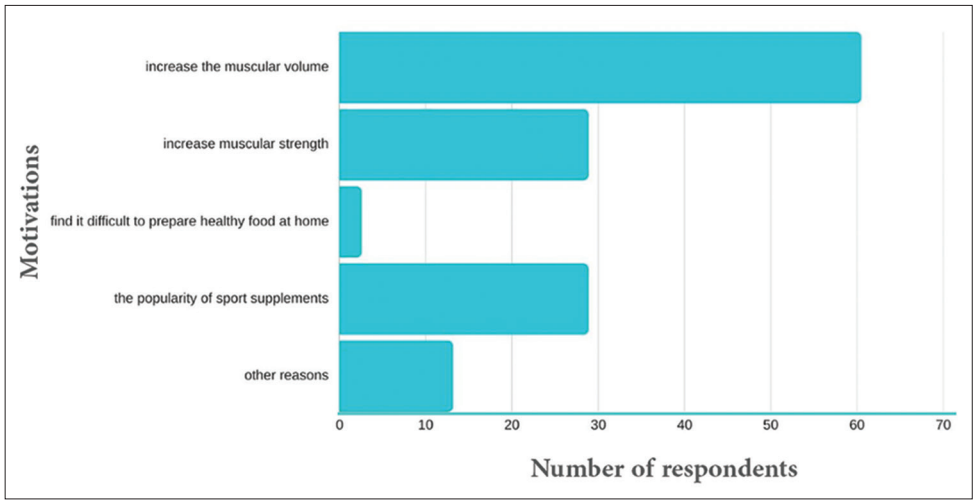

Figure 2. Reasons for supplement usage in the sub-sample that declared use (n = 38)

Table 4. Characterization of the sample in sport activity and nutritional information (n = 204)

Question	Options	n	%
Do you trust nutritional content sheet on supplements package?	Yes	156	76.5
	No	48	23.5
Did you notice any side effects of supplements taking?	Yes	38	18.6
	No	166	81.4
If yes, please mention the side effect?	Cardiovascular problems	4	10.5
	Psychological dependence	4	10.5
	Gynecomastia	12	31.6
	Fertility problems	6	15.8
	Masculine appearance in females	0	0
	Hair loss and acne	12	31.6

findings of previous research (Vogelzang, 2001) on the negative effects of dietary supplements. The results are concerning, as they suggest that a significant proportion of athletes are using sports supplements without fully understanding the potential risks associated with their consumption. This lack of awareness is particularly troubling, given the potential for sports supplements to cause harm to athletes' health. For instance, some sports supplements have been found to contain banned substances, which can lead to positive doping tests and subsequent sanctions (Abreu et al., 2023). In sequence, our results are in line with other studies, suggesting that the use of sports supplements can have unintended and potentially harmful consequences for athletes and individuals who consume them. Cohen et al. (2014b) discovered the presence of banned drugs in dietary supplements even after FDA recalls, highlighting the risks associated with these products. Similarly, Geller et al. (2015) reported a significant number of emergency department visits due to adverse events related to dietary supplements, underscoring the potential health risks. Deldicque and Francaux (2016) also emphasized the potential harmful effects of dietary supplements in sports medicine, while Piemontese (2017) explored the benefits and risks of plant food supplements with antioxidant properties.

The high prevalence of sports supplement use among athletes is likely driven by a range of factors, including the pressure to perform, the desire to gain a competitive edge, and the influence of coaches, teammates, and social media (Parnell et al., 2015; Vinnikov et al., 2018). However, athletes, coaches, and sports organizations must recognize the potential risks associated with sports supplement use and take steps to educate athletes about the safe and responsible use of these products. One of the most significant concerns regarding sports supplement use is the industry's lack of regulation and oversight. Unlike prescription medications, sports supplements are not subject to the same level of scrutiny and testing, which means that athletes may be consuming products that are contaminated, adulterated, or ineffective (Cohen et al., 2014b). Furthermore, many sports supplements are marketed with misleading or unsubstantiated claims, which can lead athletes to believe that they are safe and effective when, in fact, they may be harmful (Piemontese, 2017). In light of these findings, it is essential that athletes, coaches, and sports organizations take a more cautious and informed approach to sports supplement use. This includes educating athletes about the potential risks associated with sports supplement use, encouraging athletes to consult with healthcare professionals before using sports supplements, and advocating for stricter regulation and oversight of the sports supplement industry. Hence, the current findings underscore the need for awareness about the risks associated with dietary supplements. Athletes, coaches, and sports medicine professionals must be educated about the potential dangers, and policymakers should strengthen regulations to ensure the safety and efficacy of these products, thereby safeguarding athletes' health and fair competition.

The lack of professional guidance in supplement use can have far-reaching consequences, including ineffective supplementation and adverse health effects. Many athletes rely on misinformation or unsubstantiated claims when selecting supplements, rather than scientific evidence (Lowery & Devia, 2009). This highlights the importance of consulting with

qualified healthcare professionals, such as sports dietitians or physicians, who can provide personalized guidance on supplement use. The variability in the quality and regulation of sports supplements further underscores the need for professional guidance. The dietary supplement industry is largely self-regulated, with limited oversight by government agencies, resulting in inconsistent product quality and labelling (Dvorkin & Gardiner, 2003; Walker et al., 2020; Carlo et al., 2022; Tallon et al., 2024). Therefore, athletes must be educated on the differences in product formulations, manufacturing processes, and quality control measures to ensure informed decision-making. Subsequently, it is essential to promote a culture of informed decision-making and caution, encouraging athletes to consult with qualified healthcare professionals and prioritize education and awareness about the safe and effective use of sports supplements.

Targeted educational interventions are essential for fostering a culture of safety and informed decision-making among athletes, thereby mitigating the risks associated with dietary supplement use. By targeting athletes, coaches, and sports dietitians, these programs can provide accurate information about the benefits and risks of supplements, as well as strategies for safe use. The International Olympic Committee's guidelines for the use of supplements in sports, which emphasize the importance of consulting with a sports dietitian or healthcare professional before using supplements, serve as a valuable resource (International Olympic Committee, 2019). Similarly, the National Collegiate Athletic Association's guidelines for the use of supplements in college athletics, which prohibit the use of certain supplements and emphasize the importance of label verification, can inform educational interventions (National Collegiate Athletic Association, 2020). Furthermore, it is essential to address the ethical considerations surrounding supplement use in sports. The use of supplements raises important ethical questions about fairness, justice, and the integrity of sports. For instance, the use of performance-enhancing supplements can create an unfair advantage, compromising the integrity of competitions. Additionally, the use of supplements can perpetuate harmful stereotypes and reinforce damaging gender norms, particularly in sports where masculinity is closely tied to athletic performance. By addressing these ethical considerations and developing a comprehensive framework for the safe use of supplements, we can promote a culture of safety, fairness, and integrity in sports.

Considering all above concerns, to promote informed decision-making and safe practices, athletes should be encouraged to prioritize a balanced diet and a healthy lifestyle, rather than relying on supplements as a quick fix. Athletes should exercise prudence in supplement usage due to the potential discrepancy between the intended purpose of supplementation and its practical application. Seeking counsel from qualified professionals, such as registered dietitians or sports medicine physicians, and consulting reputable sources for accurate information is recommended to enable athletes to make well-informed choices regarding supplement utilization. This may involve consulting with a healthcare professional to develop a personalized nutrition plan, or seeking out credible sources of information, such as the National Institutes of Health (NIH) or the Academy of Nutrition and Dietetics (AND). Hence, it is imperative that athletes are cognizant of the potential pharmacological interactions between supplements and medications, and the latent risks associated with prolonged consumption, to ensure their safe and effective use. For example, a study published in the Journal of the American Medical Association (Huang et al., 2020) revealed a significant association between the consumption of certain supplements, including vitamin D and calcium, and an increased risk of kidney stones. This finding underscores the need for athletes to be cognizant of the potential risks and interactions inherent in supplement use and take proactive measures to mitigate these risks. Our study's focus on the burgeoning trend of protein supplements in sports intersects with the results of a recent survey by Vaccaro et al. (2024), which found that approximately 60% of athletes rely on dietary supplements to enhance their performance, with protein powder being the most widely used supplement. While some supplements may offer benefits for athletes, the attendant risks cannot be disregarded. By promoting informed decision-making and safe practices, these interventions can contribute to optimizing athletic performance while safeguarding the health and well-being of athletes.

Expert guidance is crucial for promoting awareness about sports supplements. Sports dietitians, nutritionists, and healthcare professionals can provide personalized advice to athletes, helping them navigate the complex world of sports supplements. These experts can develop personalized nutrition plans that meet athletes' specific needs and goals. Furthermore, online platforms can facilitate access to expert guidance, enabling athletes to make informed decisions about sports supplements. The ISSN, National Science Foundation (NSF) International, and other certification bodies can also verify the authenticity and efficacy of sports supplements, ensuring athletes choose safe and effective products that meet rigorous standards for quality, purity, and safety.

In conclusion, a multifaceted approach is necessary to promote awareness about sports supplements. Educational programs, informed sport quality certification, and expert guidance can empower athletes to make informed choices. Sports organizations, government agencies, and sports nutrition companies must collaborate to establish guidelines, provide resources, and fund research, ultimately promoting safe and informed practices that optimize athletic performance and health.

Limitations of the Study

This study has several limitations. The reliance on self-reported data may introduce bias and inaccuracy. Future studies should consider objective measures to validate findings. Although sufficient for this study, the sample size of 204 participants may limit generalizability. Exploring specific types of sports supplements used by athletes could provide valuable insights. The survey-based methodology may not capture the full complexity of sports supplement use. Furthermore, the sample demographics may not be representative of the broader athletic population, which may limit

the generalizability of the findings. Future research should address these limitations to enhance the understanding of sports supplement use among athletes.

Strengths and Practical Implications of the Study

This study has several strengths and practical implications. The findings highlight the need for education and awareness campaigns targeting athletes, coaches, and sports organizations about the risks associated with sports supplement use. The results inform the development of educational programs promoting safe and healthy practices among athletes, such as providing accurate information on supplement benefits and risks, and prioritizing nutritional knowledge. The study's results also suggest targeting young adult athletes, consulting healthcare professionals before using supplements, and developing evidence-based guidelines and policies for responsible supplement use.

CONCLUSION

Government and non-governmental organizations must implement comprehensive awareness campaigns to address the potential hazards of dietary supplement use in sports. These campaigns play a crucial role in educating athletes, coaches, and the public about the risks associated with indiscriminate supplement use, promoting safer practices in sports nutrition. Monitoring and evaluating the effectiveness of these initiatives, addressing potential financial barriers to accessing professional guidance, and advocating for stricter regulations are essential steps in safeguarding athletes' well-being and ensuring informed decision-making regarding supplement use. Additionally, strategies such as identifying reliable sources, evaluating credibility, utilizing trusted websites, and prioritizing peer-reviewed research can help ensure the public has access to accurate and reliable information despite challenges in dissemination and availability.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study received the requisite ethics approval from the esteemed Research Ethics Committee of Al-Sham Private University Review Board (ASPU-RB), as denoted by the Approval ID: ASPU-RB-2024-058. Prior to recruitment, the study's objectives, methodology, and potential implications were meticulously explained to all participants, ensuring their comprehensive understanding. Subsequently, a written Informed Consent Form was obtained from each participant, thereby guaranteeing their voluntary and informed participation. Throughout the study, the procedures were rigorously conducted in accordance with the principles enshrined in the Declaration of Helsinki, thereby upholding the highest standards of research ethics and integrity.

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