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Assessment of Dietary Supplement Use, Awareness, and Energy Expenditure among Gym-goers in Aden Governorate, Yemen

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ABSTRACT

Background: Dietary supplements (DS) containing vitamins, proteins, and minerals are widely used by gym-goers to enhance health, recovery, and performance. However, awareness of their safe use, nutritional adequacy, and energy balance varies considerably.
Objective: To assess dietary supplement use, awareness, and energy balance among gym-goers in Aden Governorate, Yemen.
Methods: A cross-sectional study was conducted among 270 gym-goers selected from five gyms using stratified multi-stage sampling. Data on supplement consumption, calorie intake, expenditure, and awareness were collected and analyzed.
Results: Of the 270 participants, 64.8% reported using nutritional supplements. Protein powder (26.7%) and creatine (33.7%) were the most commonly consumed, followed by vitamin D (20%), zinc (18.9%), and multivitamins (18.5%). Calcium (8.9%) and biotin (4.4%) were less frequently used, while fat burners, herbal products, and ginseng were reported by fewer than 3%. Most respondents were aware of potential adverse effects (67%) and supplement misuse risks (66.6%); 67.8% sought medical advice, and 51.1% were able to interpret product labels. Reported benefits included muscle building (55.6%), increased energy (33.7%), and weight loss (29.3%). Dietary analysis showed inadequate intake, with all gym-goers consuming <6 g/kg of carbohydrates, 78.9% consuming <20% of calories from fat, and 95.9% consuming ≤1.6 g/kg of protein. Supplement use was significantly associated with education, occupation, income, and awareness ($p = 0.001$), and protein powder use correlated with higher TDEE ($p = 0.007$).
Conclusion: Supplement use is common among gym-goers but is accompanied by nutritional imbalances and limited awareness of risks. Educational programs are recommended to promote balanced diets and informed, evidence-based supplement use.

Keywords: Dietary supplements, gym-goers, energy, awareness, metabolic equivalent.

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INTRODUCTION

Both recreational and competitive sports environments have seen a rise in the use of dietary supplements (DS). These DS fall under the category of food products that include one or more dietary components, such as vitamins, minerals, botanical ingredients, herbs, amino acids, and other substances like metabolites, enzymes, or extracts [1]. These products are readily available and commonly used to increase the nutritional value of ordinary diets. They come in a variety of forms, including soft gels, tablets, capsules, liquids, and powders [2, 3]. A lot of people use DS to attain particular performance-related objectives or to enhance health outcomes [4].

Despite their widespread use, these products' marketing claims are frequently deceptive, and many of their claimed advantages lack solid scientific backing [5]. When consuming nutritional supplements, gym-goers in particular are at increased risk if they depend on goods that contain steroids or other performance-enhancing drugs. Dependence on many, frequently untrustworthy information sources increases this risk by causing misunderstandings and even abuse [6]. This kind of abuse could result in dangerous interactions, the ingestion of risky or inactive substances, or unintentional exposure to prohibited doping chemicals [7].

Research indicates that athletes and fitness enthusiasts commonly use DS to maintain health and support a balanced diet alongside physical activity [8]. Gyms attract many individuals aiming to improve performance and fitness, with a substantial proportion using dietary supplements to fulfill specific nutritional needs. Bodybuilders are a primary target market for these products, frequently consuming large quantities of protein supplements derived from sources such as whey, casein, and plant-based proteins like soy isolates [9].

Due to the rapid growth in its use globally, the DS industry is expected to double in size by 2028, from its estimated USD 152 billion in 2021 [10]. Physically active individuals often use supplements to enhance their overall health, performance, and appearance [11]. However,

Many users lack sufficient knowledge about safe use and the health risks associated with it [12]. Furthermore, many individuals may not ingest adequate amounts of protein [13]. Despite the growing use of dietary supplements among gym-goers, little research has examined the relationship between supplement intake patterns, user awareness, and energy expenditure in the Middle East, particularly in Yemen. This research attempts to fill this knowledge gap by identifying the most commonly used dietary supplements among gym-goers in Aden, determining whether supplement use and total daily energy expenditure (TDEE) are associated, and measuring gym patrons' awareness of the safety and effectiveness of these supplements.

METHODS

Study Design

This cross-sectional, community-based study was conducted in Yemen's Aden Governorate from September 2024 to May 2025. It focused on regular gym-goers aged 18 or older who attended five randomly selected gyms: Sports Champions, Super Gym, Pump Gym, NMA Gym, and World Gym.

Inclusion and Exclusion Criteria

Participants who attended two to three times per week for at least three months and provided their informed consent were included in the inclusion criteria, but those who were not frequent attendees (less than once a week) or who had health issues that might affect the use of supplements (such as severe allergies or chronic illnesses) were excluded.

Sample Size

A total of 832 individuals (674 men and 158 women) attended the selected gyms. The required sample size (n=270) was calculated using the following formula with a 5% margin of error.

Formula: $n = N / (1 + N \times e^2)$ [14]

Data Collection

Data was collected during both morning and evening shifts from November 2024 to February 2025 using a standardized questionnaire. The questionnaire covered demographic information, the usage of dietary supplements, awareness, motivations, sources of information, reported health impacts, and a 24-hour dietary recall. Gymgoers were asked to provide a thorough description of every food and drink they had ingested during the previous 24 hours as part of a 24-hour dietary recall. Regular meals, snacks, beverages, and any additional dietary intake

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were included, as well as the appropriate time for consumption.

Energy Expenditure Estimation

Estimating energy expenditure from physical activities using Metabolic Equivalent of Physical Activity Task (MET) values

Calories burned per minute = MET × 3.5 × weight in kg / 200

Where:

MET represents the energy cost of physical activity.

3.5 represents resting oxygen consumption in milliliters per kilogram per minute (ml/kg/min). Weight refers to the participant's body weight in kilograms.

The constant 200 adjusts the output for common calorie calculations based on energy expenditure.

Calculating Basal Metabolic Rate (BMR), using the Mifflin-St Jeor equation for adults (≥19 years) and a modified equation for 18-year-olds to account for adolescent metabolism [15].

The equations used were as follows:

EER = 88.5 – 61.9 × age [y] + PA ×(26.7 × wt [kg] + 903 × ht [m]) + 25(kcal for energy deposition) (Boys 9–18 years).

EER = 135.3 – 30.8 × age [y] + PA ×(10 × wt [kg] + 934 × ht [m]) + 25(kcal for energy deposition) (Girls 9–18 years).

The Mifflin-St Jeor equation, considered the most accurate for individuals aged 19–78 years [16], was used to estimate Basal Metabolic Rate (BMR).

For men: BMR = 10 × weight in kg + 6.25 × height in cm – 5 × age in years + 5

For women: BMR = 10 × weight in kg + 6.25 × height in cm – 5 × age in years – 161

where PA denotes the physical activity coefficient.

Total Daily Energy Expenditure (TDEE) was calculated by adding energy expenditure from physical activities (based on MET values) to the adjusted BMR.

These equations are appropriate for a cross-sectional study, as they provide accurate, non-invasive estimates of energy needs at a single point in time, aligning with the study's aim to assess energy balance, supplement use, and physical activity patterns.

Data Analysis

To provide an overview of the research population and to characterize the dataset's salient features, descriptive statistics were employed. Relationships between the study variables were examined using inferential statistical techniques. To guarantee accuracy and analytical consistency, SPSS software (version 25) was used for all analyses. For continuous data, means and standard deviations were calculated, and relationships between categorical variables were evaluated using chi-square tests. P-values were used to assess statistical significance; a threshold of $p < 0.05$ was deemed statistically significant.

Ethical Approval

This study adhered to accepted ethical guidelines. The administration of the gym and the University Research Committee gave their approval. After outlining the goals of the study, its advantages, and the participants' freedom to withdraw at any time, verbal informed permission was obtained. These protocols guaranteed each gym patron's autonomy, beneficence, and respect.

RESULTS

Table 1 shows that 64.8% of gym-goers used dietary supplements. Creatine (33.7%) and protein powder (26.7%) were the most commonly used, mainly for muscle support. Vitamins like D (20%) and minerals such as zinc (18.9%) and multivitamins (18.5%) were also frequently used. Calcium (8.9%) and biotin (4.4%) were less common, while fat burners, ginseng, and herbal supplements were rarely taken (<3%). More than one-third (35.2%) reported not using any supplements.

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Table 1: Dietary Supplements Intake and Types Used by Gym-goers

Supplement use		No.	%
Yes		175	64.8
No		95	35.2
Total		**270**	**100.0**
Types of dietary supplements		**No**	**%**
Protein powders	Yes	72	26.7
	No	103	38.1
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Amino acids	Yes	18	6.7
	No	157	58.1
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Multivitamins	Yes	50	18.5
	No	125	46.3
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Vitamin D	Yes	54	20.0
	No	121	44.8
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Calcium	Yes	24	8.9
	No	151	55.9
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Biotin	Yes	12	4.4
	No	163	60.4
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Zinc	Yes	51	18.9
	No	124	45.9
	Don`t use the supplement	95	35.2
	Total	**270**	**100.0**
Creatine	Yes	91	33.7
	No	84	31.1
	Don`t use a supplement	95	35.2
	Total	**270**	**100.0**
Fat burners	Yes	8	3.0
	No	167	61.9
	Don`t use a supplement	95	35.1
	Total	**270**	**100.0**
Herbal supplements	Yes	5	1.8
	No	170	63.0
	Don`t use the supplement	95	35.2
	Total	**270**	**100.0**

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	Es	40	14.8
	No	135	50.0
Omega-3 fatty acids	Don`t use the supplement	95	35.2
	Total	**270**	**100.0**
	Yes	21	7.8
	No	154	57.0
Collagen	Don`t use the supplement	95	35.2
	Total	**270**	**100.0**
	Yes	8	3.0
	No	167	61.9
Ginseng	Don`t use the supplement	95	35.1
	Total	**270**	**100.0**
Iron	Yes	32	11.9
	No	143	53.0
	Don`t use supplement	95	35.1
	Total	**270**	**100.0**
Vitamin C	Yes	37	13.7
	No	138	51.1
	Don`t use the supplement	95	35.2
	Total	**270**	**100.0**
Folic Acid	Yes	9	3.3
	No	166	61.5
	Don`t use the supplement	95	35.2
	Total	**270**	**100.0**

Table 2 shows that 28.9% of gym-goers were very aware of dietary supplements' side effects. (38.1%) were somewhat aware, (21.1%) were unaware, and (11.9%) had not considered them. Most gym-goers (67.8%) consulted healthcare professionals, while 21.1% did not, and 11.1% did not use supplements. Awareness of the risks associated with misuse was reported by 66.6%, with 17.8% unaware and 15.6% uncertain. Confidence in reading supplement labels was reported by 51.1%, while 33% lacked confidence and 15.9% were somewhat confident.

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Table 2: Awareness and Knowledge of Dietary Supplements among Gym-goers.

Awareness of dietary supplement side effects	**No.**	**%**
Very aware	78	28.9
Somewhat aware	103	38.1
Not aware at all.	57	21.1
haven`t considered side effects	32	11.9
Total	**270**	**100.0**
Consulting with **healthcare professionals**	**No.**	**%**
Yes	183	67.8
No	57	21.1
Do not take supplements	30	11.1
Total	**270**	**100.0**
Awareness of the risks of Misusing **DS**	**No.**	**%**
Yes	180	66.6
No	48	17.8
Uncertain	42	15.6
Total	**270**	**100.0**
Ability to understand DS labels	**No.**	**%**
Yes	138	51.1
No	89	33.0
Somewhat	43	15.9
Total	**270**	**100.0**

DS: Dietary Supplement

Table 3 reveals that half of gym-goers thought dietary supplements were beneficial to their health, while the other half did not. The most common benefits noted by those who reported them were weight loss (29.3%), greater energy (33.7%), and muscle gain (55.6%). Furthermore, (25.9%) of individuals noted quicker recovery following workouts, (18.1%) mentioned immune system assistance, and (19.3%) reported greater results when supplements were paired with a balanced diet. Interestingly, 10% of respondents thought there were no appreciable advantages to dietary supplements.

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Table 3: Perceived Benefits of Dietary Supplements among Gym-goers.

Perceived benefits of dietary supplements.		No	%
Improving physical well-being	Yes	135	50.0
	No	135	50.0
	Total	**270**	**100.0**
Muscle gain	Yes	150	55.6
	No	120	44.4
	Total	**270**	**100.0**
Weight loss	Yes	79	29.3
	No	191	70.7
	Total	**270**	**100.0**
Increased energy levels	Yes	91	33.7
	No	179	66.3
	Total	**270**	**100.0**
Better results with a proper diet	Yes	52	19.3
	No	218	80.7
	Total	**270**	**100.0**
Faster recovery after workouts	Yes	**70**	25.9
	No	200	74.1
	Total	**270**	**100.0**
Support immune health	Yes	49	18.1
	No	221	81.9
	Total	**270**	**100.0**
No significant benefits	Yes	27	10.0
	No	243	90.0
	Total	**270**	**100.0**

According to Table 4, all gym-goers consumed fewer than 420 grams of carbohydrates per day, with 100% falling below the 6 g/kg cut-off. No gym-goers reported consuming 6–8 g/kg (420–560 g) of carbohydrates. In terms of protein consumption, 95.9% of gym-goers ingested ≤1.6 g/kg, or ≤112 grams daily, while only 4.1% went over this limit. Regarding fat intake, 78.9% of gym-goers ate less than 56 grams of fat per day, or less than 20% of their daily calories. Only 0.7% of gym-goers consumed more than 35% of their daily calories from fat, or more than 98 grams per day, whereas a smaller percentage (20.4%) consumed 20–35% of their daily calories from fat (56–98 g).

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Table 4: Gym-goers' intake of Fat, Protein, and Carbohydrates

Carbohydrate	**No.**	**%**
<6 (g/kg)	270	100.0
6-8 (g/kg)	0	0.0
>8 (g/kg)	0	0.0
Total	**270**	**100.0**

"< 6 g/kg = (<420 g), 6-8(g/kg = (420-560 g), >8 g/kg = (>560 g)."

Protein	**No.**	**%**
≤1.6 (g/kg)	259	95.9
>1.6 (g/kg)	11	4.1
Total	**270**	**100.0**

≤ 1.6(g/kg) = (≤112g), >1.6 (g/kg) = (>112g).

Fat	**No.**	**%**
< 20 %	213	78.9
20-35 %	55	20.4
>35 %	2	0.7
Total	**270**	**100.0**

"< 20 % =(<56g) , 20-35 %=(56-98g) , >35 %=(>98g)"

The mean TDEE and calorie intake of male gym-goers were (2645.55 ± 346.58 kcal) and (1619.31 ± 294.54 kcal), respectively, whereas the mean TDEE and caloric intake of female gym-goers were (2071.78 ± 346.99 kcal) and (1192.88 ± 249.46 kcal), respectively.

Table 5: Mean and Standard Deviation of Male and Female Gym-goers' Caloric Intake and Energy Expenditure.

Parameters	**Calorie intake (kcal)**	**TDEE (kcal)**
Male (Mean ±SD)	1619.31±294.54	2645.55 34±6.58
Female (Mean± SD)	1192.88± 249.46	2071.78±346.99

More than half (51%) of the gym-goers who consumed protein powder supplements had Total Daily Energy Expenditure (TDEE) in the (2400–2800) kcal range, which is indicative of moderate levels of physical activity, according to Table 6. Only 6% had a TDEE above 3200 kcal, and a lesser percentage (17%) had a TDEE below 2400 kcal, indicating that exceptionally high energy expenditure was comparatively uncommon. With a mean TDEE of 2290.4 ± 112.78 kcal, this group showed minimal variation in daily energy expenditure among protein supplement users.

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Table 6: Energy Expenditure among Gym-goers Consuming Protein Supplements

TDEE	No.	%
<2400 kcal	12	17
2400-2800 kcal	37	51
2801-3200 kcal	19	26
>3200 kcal	4	6
Total	**72**	**100**
Mean ± SD = 2290.4 ± 112.78		

As shown in Tables 7 and 8, supplement use was significantly associated with education level, occupation, monthly income, and awareness of side effects (p = 0.001), with users demonstrating greater awareness than non-users. No significant associations were found with age, gender, or marital status. Additionally, Table 9 shows that protein powder supplement use was significantly associated with higher Total Daily Energy Expenditure (TDEE) (p = 0.007).

Table 7: Association between Supplement Use and Socio-Demographic Variables among Gym-goers.

Age group	Supplements use		Total
	Yes	No	
18	4 (66.7%)	2 (33.3%)	6 (100%)
19-29	150 (67.2%)	73 (32.8%)	223 (100%)
30-39	11 (45.8%)	13 (54.2%)	24 (100%)
40-49	7 (50%)	7 (50%)	14 (100%)
≥50	3 (100%)	0 (0.0)	3 (100%)
Total	**175 (64.8%)**	**95 (35.2%)**	**270 (100%)**
χ^2 **=7.364, df = 4, *p* = 0.118**			
Gender	**Supplements use**		**Total**
	Yes	**No**	
Male	147 (67.2%)	72 (32.8%)	219 (100%)
Female	28 (54.9%)	23 (45.1%)	51 (100%)
Total	**175 (64.8%)**	**95 (35.2%)**	**270 (100%)**
χ^2 **= 2.709, df = 1, *p* = 0.100**			
Marital Status	**Supplements use**		**Total**
	Yes	**No**	
Married	50 (67.6%)	24 (32.4%)	74 (100%)
Single	124 (63.9%)	70 (36.1%)	194 (100%)
Divorced	1 (50%)	1 (50%)	2 (100%)
Total	**175 (64.8%)**	**95 (35.2%)**	**270(100%)**
χ^2 **= 0.507, df = 2, *p* = 0.776**			

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Educational Level	**Supplements use**		**Total**
	Yes	**No**	
Primary	9 (56.2%)	7 (43.8%)	16 (100%)
Secondary	31 (45.6%)	37 (54.4%)	68 (100%)
University	130 (72.2%)	50 (27.8%)	180 (100%)
Postgraduate	5 (83.3%)	1 (16.7%)	6 (100%)
Total	**175 (64.8%)**	**95 (35.2%)**	**270 (100%)**
$\chi^2 = 16.770$, df = 3, $p = 0.001$			
Occupation	**Supplements use**		**Total**
	Yes	**No**	
Government employee	15 (60%)	10 (40%)	25 (100%)
Business/self-employed	57 (66.3%)	29 (33.7%)	86 (100%)
Not working	36 (49.3%)	37 (50.7%)	73 (100%)
Housewife	7 (41.2%)	10 (58.8%)	17 (100%)
Other	60 (87%)	9 (13%)	69 (100%)
Total	**175 (64.8%)**	**95 (35.2%)**	**270 (100%)**
$\chi^2 = 27.024$, df = 4, $p = 0.001$			
Monthly income (YER)	**Supplements use**		**Total**
	Yes	**No**	
Very low	10 (43.5%)	13 (56.5%)	23 (100%)
Low	24 (52.2%)	22 (47.8%)	46 (100%)
Moderate	26 (53.1%)	23 (46.9%)	49 (100%)
Above moderate	27 (87.1%)	4 (12.9%)	31 (100%)
High	36 (81.8%)	8 (18.2%)	44 (100%)
Prefer not to answer	52 (67.5%)	25 (32.5%)	77 (100%)
Total	**175 (64.8%)**	**95 (35.2%)**	**270 (100%)**
$\chi^2 = 23.359$, df = 5, $p = 0.001$			
Very Low; <35000, Low; 35000-149000, Moderate; 150000-200000, Above moderate; 201000-399000, High; ≥400000, Yemeni Rial.			

Table 8: Association between Supplement Use and Awareness of Dietary Supplement Side Effects.

supplement use	**Awareness of dietary supplement side effects**				**Total**
	Very aware	**Somewhat aware**	**Not aware at all**	**"I haven`t considered side effects."**	
Yes	65 (24.1%)	67 (24.8%)	30 (11.1%)	13 (4.8%)	175 (64.8%)
No	13 (4.8%)	36 (13.3%)	27 (10%)	19 (7%)	95 (35.2%)
Total	**78 (28.9%)**	**103 (38.1%)**	**57 (21.1%)**	**32 (11.9%)**	**270 (100%)**
$\chi^2 = 23.652$, df = 3, $p = 0.001$					

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Table 9: Association between Protein Powder Supplement use and Energy expenditure

TDEE(Kcal)	Protein supplement use			Total
	Yes	No	Don't use the supplement	
<2400	12 (12.9%)	41 (44.1%)	40 (43.0%)	**93 (100%)**
2400-2800	37 (34.6%)	32 (29.9%)	38 (35.5%)	**107 (100%)**
2801-3200	19 (32.8%)	24 (41.4%)	15 (25.8%)	**58 (100%)**
>3200	4 (33.3%)	6 (50.0%)	2 (16.7%)	**12 (100%)**
Total	**72 (26.7%)**	**103 (38.1%)**	**95 (35.2%)**	**270 (100%)**

$\chi^2 = 17.716$, df = 6, $p = 0.007$

DISCUSSION

According to the present study, young adults were the most likely to use dietary supplements (DS) when attending the gym. This finding is consistent with previous research [17], which noted that younger individuals are generally more interested in fitness and health. In line with another study [18], there was a pronounced gender disparity, with men predominating and using performance-enhancing supplements more frequently. Similar to other findings addressing the role of education in health literacy, most participants had either secondary or university-level education. Income diversity also played a role [19,20] as individuals with higher incomes tended to consume more specialized supplements [21,22].

The most common supplements used by gym-goers, primarily for strength and recovery, include creatine—taken by about one-third—and protein powder, which around a quarter of them use. This aligns with the findings of various studies [23-25]. Furthermore, due to rising awareness about overall health, vitamin D and multivitamins are also popular choices [26]. Interestingly, in contrast to global trends, roughly one-third of individuals reported that they do not take any supplements, possibly due to skepticism or a preference for whole foods [27]. According to previous research, supplements like ginseng, collagen, and fat burners remain relatively uncommon. Most gym-goers indicated they have been taking supplements for 7 to 12 months, suggesting a more recent or cautious approach to supplementation [28]. While early usage sometimes led to temporary discomfort, side effects were generally rare and mild, consistent with the findings of previous studies [29,30].

More than two-thirds of gym-goers were aware of supplement side effects, though some lacked full knowledge. Awareness was significantly associated with supplement use (0.001). This is consistent with earlier research that found comparable patterns in gym-goers' attentiveness levels [31-33].

In this study, about half of the gym-goers believed that taking nutritional supplements would enhance their health; the most often cited benefits were muscle gain, increased energy, and weight loss. While lower percentages mentioned immunological support, better outcomes were achieved when combined with a balanced diet. Dietary supplements are generally believed to improve overall health, energy, and muscle growth [34]. Their impact on immunity and recuperation, however, is yet unknown, and research has shown that supplements offer few advantages for people who already eat well [35,36].

Carbohydrate consumption among gym-goers was found to be below the recommended intake of 6 g/kg/day for physically active individuals. This deficiency may be attributed to adherence to low-carbohydrate dietary regimens or a lack of awareness regarding appropriate nutritional practices [28,37]. Furthermore, protein intake was predominantly

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inadequate, which aligns with previous findings [39,40]. Additionally, the fat intake levels were frequently observed to be excessively low, indicating that individuals engaged in gym activities often followed overly restrictive dietary plans [41].

Despite having a TDEE of 2645.55 kcal, male gym-goers consumed an average of 1619.31 kcal; females consumed 1192.88 kcal compared to a TDEE of 2071.78 kcal, demonstrating significant deficits. This is consistent with research that links undereating to impaired performance and recovery [42,43].

The findings demonstrated strong correlations between supplement usage and monthly income ($p = 0.000$), occupation ($p = 0.000$), and educational level ($p = 0.001$), suggesting that higher income, particular vocations, and higher education all increase the risk of supplement use. In line with earlier research, this illustrates the impact of socioeconomic determinants on health behaviors, perhaps as a result of improved health literacy [31,44].

The use of dietary supplements and adverse effect awareness were shown to be significantly correlated ($p = 0.000$). Users were more likely to be "very aware" of possible hazards, indicating that they knew more about health. This is consistent with research demonstrating that frequent users actively look for information about supplements [45]. On the other hand, non-users were more frequently ignorant, perhaps as a result of a lack of interest or health literacy, which could lead to supplement avoidance owing to fear or misunderstandings [20].

Due to their higher energy needs for maintaining their muscles, most gym-goers had a Total Daily Energy Expenditure (TDEE) between 2400 and 2800 kcal. The consumption of protein powder and TDEE was shown to be significantly correlated ($p = 0.007$). The small number of elite athletes in the sample may be the reason for the comparatively low percentage of gymgoers with TDEE values higher than 3200 kcal. In general, the usage of supplements, especially protein powder and creatine, was linked to socioeconomic position and awareness of possible adverse effects; those with greater understanding were more likely to use these items [46,47].

CONCLUSION

Among young gymgoers, the usage of dietary supplements was substantially correlated with awareness, income, and education. The most widely utilized supplements were protein and creatine powders, which were usually taken by knowledgeable people. Calorie and carbohydrate intake were frequently insufficient despite high levels of physical activity, indicating the need for better dietary instruction and individualized counseling.

Author's Contribution

Somiya Gutbi Salim Mohammed provided conceptual guidance, ensured scientific rigor throughout the research process, critically reviewed and refined the manuscript drafts, and offered methodological mentorship. The remaining authors contributed by formulating the research topic, conducting data collection and analysis, and preparing the initial manuscript. Together, all authors collaborated to ensure that the study is methodologically robust, well-organized, and aligned with established scholarly standards.

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Conflict of Interest

The authors declare that there is 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. 2018;15(1):88–97.

[2] Garcez Nabuco HC, Behrends Rodrigues V, Souza Fernandes VL, De Paula Ravagnani FC, Fett CA, Martínez Espinosa M, et al. *[Title not provided]*. Nutr Hosp. 2016;33(3):278.

[3] Wardenaar KJ, Lim CCW, Al-Hamzawi AO, Alonso J, Andrade LH, Benjet C, et al. The cross-national epidemiology of specific phobia in the World Mental Health Surveys. Psychol Med. 2017;47(10):1744–60.

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[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;14:26.

[5] Alfawaz H, Khan N, Almarshad A, Wani K, Aljumah MA, Khattak MNK, et al. The prevalence and awareness concerning dietary supplement use among Saudi adolescents. Int J Environ Res Public Health. 2020;17(10):E3512.

[6] Jawadi AH, Addar AM, Alazzam AS, Alrabieah FO, Al Alsheikh AS, Amer RR, et al. Prevalence of dietary supplements use among gymnasium users. J Nutr Metab. 2017;2017:9219361.

[7] 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):614–29.

[8] Kovács I, Liska F, Veres Z. Motivational drivers behind the consumption of dietary supplements by leisure-time athletes. Foods. 2023;12(16):3032.

[9] Finamore A, Benvenuti L, De Santis A, Cinti S, Rossi L. Sportsmen's attitude towards dietary supplements and nutrition knowledge: an investigation in selected Roman area gyms. Nutrients. 2022;14(5):1062.

[10] Djaoudene O, Romano A, Bradai YD, Zebiri F, Ouchene A, Yousfi Y, et al. A global overview of dietary supplements: regulation, market trends, usage during the COVID-19 pandemic, and health effects. Nutrients. 2023;15(15):3359.

[11] Alhomoud FK, Basil M, Bondarev AK. Knowledge, attitudes and practices relating to dietary supplements among health sciences and non-health sciences students in UAE. J Clin Diagn Res. 2016;10(9):JC05–JC09.

[12] Alqrache A, Mostafa M, Ghabrah O, Ghabrah Z, Kamal N, Ghabrah T, et al. Knowledge and patterns of dietary supplement use among students attending King Abdulaziz University in Saudi Arabia: a cross-sectional study. Inquiry. 2021;58:00469580211020882.

[13] Ghazzawi HA, Hussain MA, Raziq KM, Alsendi KK, Alaamer RO, Jaradat M, et al. Exploring the relationship between micronutrients and athletic performance: a systematic review. Sports (Basel). 2023;11(6):122.

[14] Slovin ES. Formula for sampling technique. 1960. Available from: Internet.

[15] Width M, Reinhard T. The essential pocket guide for clinical nutrition. Burlington (MA): Jones & Bartlett Learning; 2024.

[16] Mifflin MD, St Jeor ST, Hill LA, Scott BJ, Daugherty SA, Koh YO. A new predictive equation for resting energy expenditure in healthy individuals. Am J Clin Nutr. 1990;51(2):241–7.

[17] Vuckovic V, Duric S. Motivational variations in fitness: a population study of exercise modalities, gender and relationship status. Front Psychol. 2024;15:1377947.

[18] Aguilar-Navarro M, Baltazar-Martins G, Brito de Souza D, Muñoz-Guerra J, Del Mar Plata M, Del Coso J. Gender differences in prevalence and patterns of dietary supplement use in elite athletes. Res Q Exerc Sport. 2021;92(4):659–68.

[19] Hamilton KP, Ziegler J, Samavat H, Wardenaar F, Esopenko C, Womack J, et al. Nutritional supplement use among NCAA student-athletes. J Diet Suppl. 2023;20(6):911–25.

[20] Chiba T, Kobayashi E, Okura T, Sekimoto M, Mizuno H, Saito M, et al. An educational intervention improved knowledge of dietary supplements in college students. BMC Public Health. 2020;20:1693.

[21] Hatch AM, Cole RE, DiChiara AJ, McGraw SM, Merrill EP, Wright AO, et al. Personality traits and occupational demands linked to dietary supplement use in soldiers. Mil Med. 2019;184(3–4):e253–62.

[22] Mahdavi-Roshan M, Rezazadeh A, Joukar F, Khorshidi Y, Naghipour M, Mansour-Ghanaei F. Dietary supplements consumption and socioeconomic factors in northern Iran. BMC Nutr. 2021;7(1):84.

[23] Mishra S, Stierman B, Gahche JJ, Potischman N. Dietary supplement use among adults: US, 2017–2018. NCHS Data Brief. 2021;(399):1–8.

[24] Wax B, Kerksick CM, Jagim AR, Mayo JJ, Lyons BC, Kreider RB. Creatine for exercise and sports performance. Nutrients. 2021;13(6):1915.

[25] Lopes S, Cunha M, Costa JG, Ferreira-Pêgo C. Food supplements and sports foods consumption among gym-goers in Portugal. J Int Soc Sports Nutr. 2024;21(1):2388077.

[26] Espinosa-Salas S, Gonzalez-Arias M. Nutrition: micronutrient intake, imbalances, and

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interventions. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
[27] Galman A, Chikhaoui M, Bouhrim M, Eto B, Shahat AA, Herqash RN, et al. Fitness and dietary supplements: a cross-sectional study on food practices and nutrivigilance. Nutrients. 2024;16(22):3903.
[28] Rawson ES, Miles MP, Larson-Meyer DE. Dietary supplements for health, adaptation, and recovery in athletes. Int J Sport Nutr Exerc Metab. 2018;28(2):188–99.
[29] Ronis MJJ, Pedersen KB, Watt J. Adverse effects of nutraceuticals and dietary supplements. Annu Rev Pharmacol Toxicol. 2018;58:583–601.
[30] Wierzejska RE. Dietary supplements—For whom? Int J Environ Res Public Health. 2021;18(17):8897.
[31] AlKasasbeh W, Shlool H, Natshah N, Orhan BE. Knowledge and behaviors of dietary supplement consumption among gym attendees in Amman. Food Sci Technol. 2024;12(3):199–211.
[32] Miragaia DAM, Trindade MNP, Pereira CAB. Qualifications and competence to prescribe dietary supplements: perception of fitness instructors. J Diet Suppl. 2023;20(1):68–88.
[33] Boon H, Bozinovski N. Labeling of natural health products and dietary supplements: a narrative review. J Altern Complement Med. 2019;25(8):777–88.
[34] Ganson KT, Nagata JM. Muscle-building dietary supplements in adolescents and young adults. J Adolesc Health. 2024;75(3):379–82.
[35] Magalhães PC, Encarnação S, Forte P, de Araújo Teixeira JE, Monteiro AM, Barbosa TM, et al. Machine learning classification of creatine supplement habits in gym-goers. Int J Sports Sci. 2025;15(1):1–10.
[36] Moradi F, Yazdani A, Nematolahi F, Hosseini-Roknabadi SM, Sharifi N. Supplement usage and attitudes among fitness athletes in Kashan. BMC Sports Sci Med Rehabil. 2024;16(1):150.
[37] Peters A. Health practices and the paleo diet: understanding healthy eating from adopters' perspectives [dissertation]. 2019.
[38] Noakes T, Murphy T, Wellington N, Kajee H, Bullen J, Rice ES, et al., editors. Ketogenic: the science of therapeutic carbohydrate restriction. Amsterdam: Elsevier; 2023.
[39] Gregory RM, Hamdan H, Torisky DM, Akers JD. A low-carbohydrate ketogenic diet + CrossFit improves body composition. Int J Sports Exerc Med. 2017;3(2):1–10.
[40] Ali SMF, Khan A, Khan I, Ahmed N, Hussain N, Atique T, et al. Food supplement and protein consumption patterns among gym-goers in Pakistan. Arch Manag Soc Sci. 2024;1(4):25–39.
[41] Jain K. Assessment of knowledge, perception, and use of dietary supplements in gym-goers [dissertation]. Udaipur: MPUAT; 2022.
[42] João GA, Rodriguez D, Tavares LD, Carvas Junior N, Miranda ML, Reis VM, et al. Can intensity in strength training change caloric expenditure? A systematic review. Clin Physiol Funct Imaging. 2020;40(2):55–66.
[43] Bell M, Ghatora R, Retsidou MIR, Chatzigianni EE, Klentrou P. Energy expenditure, dietary intake, and supplements in adolescent volleyball athletes. Health. 2023;20(1):633.
[44] Tan DS, Wang X, Zhao X, Zhao A. Knowledge, perception, and practice of dietary supplements among Chinese adults. Front Nutr. 2024;11:1493504.
[45] Basheer HA, Elsalem L, Jaber D, Ibraheem SM, Alhamad J, AA H. Knowledge, awareness and practices regarding dietary supplements in Jordan. Trop J Pharm Res. 2021;20(3):649–59.
[46] Lamarca F, Vieira FT, Lima RM, Nakano EY, da Costa THM, Pizato N, et al. Resistance training ± protein supplementation after gastric bypass. Obes Surg. 2021;31(4):1635–46.
[47] Saidi O, Ayed IBB, Benzarti A, Duché P, Serairi R. Intake of carbohydrate-protein supplements by recreational gym users: body composition improved. Sci Sports. 2018;33(4):e141–9.

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