Nutritional supplements and hormonal use among Gym exercisers in Jeddah city, Saudi Arabia

Fathi M. El-Gamal (1)
Abdulkareem S. Fatani (2)
Mohammed M. Mubarak (2)
Zain H. Khan (2)
Sahal A. Alardhawy (2)
Abdullah M. Alqahtani (2)

(1) Professor and chairman of Family Medicine Department, Ibn Sina National College for medical studies, Jeddah, KSA
(2) Medicine program, Ibn Sina National College, Jeddah, KSA

Corresponding author:
Prof. Fathi M. El-Gamal, Department of Family Medicine,
Ibn Sina National College. Al Mahjer Street. Jeddah, Kingdom of Saudi Arabia.
Tel: 6356555-6355882 / Fax: 6375344 – P.O. Box 31906 Jeddah 21418
Email: drfathimhelgamal1996@hotmail.com

Received: November 2020; Accepted: December 2020; Published: January 1, 2021.
Citation: Fathi M. El-Gamal et al. Nutritional supplements and hormonal use among Gym exercisers in Jeddah city, Saudi Arabia. World Family Medicine. 2021; 19(1): 183-192 DOI: 10.5742/MEWFM.2021.93968

Abstract

Background: There is a recent increase in popularity and demands of nutritional supplements and hormonal use among men and women gym exercisers; and their accompanying adverse effects are evident in the literature.

Objectives: To study the pattern and determinants of use of nutritional supplements among recreational gym exercisers in Jeddah city, Saudi Arabia.
Methods: It was a cross-sectional study which was conducted online using Google form. It was a non-probability convenient sample of 260 gym exercisers. Data was collected using a questionnaire which provided information on the socio-demographic characteristics, aspects of sport practiced, intake of nutritional supplements, as well as on the awareness of the side effects of hormones use. SPSS version 23 was used; Chi square, and Multi-nominal logistic regression tests of significance, were used; and the Odds ratio (OR) and 95% CI were calculated. The level of significance was 0.05.

Results: Nutritional supplements were used by 59.1% of the Gym exercisers. About 82% got them without advice from health care personnel; coaches were counselled on the type of nutritional supplement in 20% of the cases. They were used mainly to build muscles (52.6%), improve performance (22.2%), or to reduce weight (16.3%). Carbohydrate rich diet, weight gain supplements and fat burning supplements were the most frequently used types. Older age group exercisers were significantly more likely to use nutritional supplements (B= - 0.058). The males were 2.99 times more likely to consume nutritional supplements compared to the females (OR= 2.985; 95% CI 1.575, 5.660). The smokers were 3.541 times more likely to consume nutritional supplements compared to the nonsmokers (OR= 3.541; 95% CI 1.713, 7.313). The subjects with total period of training of more than 12 months, were significantly more likely to consume nutritional supplements compared to those with total period of 1 – 6 months (OR= 0.413; 95% CI 0.202, 0.845, $p < 0.016$), or of 7-12 months (OR= 0.308; 95% CI 0.126, 0.775, $p < 0.016$). The subjects with total period of training per day of more than 2 hours, were significantly more likely to consume nutritional supplements compared to those with total period of less than 1 hour per day (OR= 0.045; 95% CI 0.004, 0.845, $p < 0.570$, $p < 0.017$), and of 1 - 2 hours per day (OR= 0.083; 95% CI 0.007, 0.997, $p < 0.050$).

Conclusion: Use of nutritional supplements is common among the exercisers in Saudi Arabia, but mainly without medical supervision. Health education programs are needed to educate the exercisers on the potential harmful effects of supplements, if taken without medical advice and supervision. Educating gym employees may have a positive influence on the use of supplements and hormones.

Key words: Nutritional supplements, Saudi Arabia, gym exercisers

Introduction

Nutritional supplements aimed at improving physical performance or altering body composition have become readily available worldwide. Athletes have been the greatest consumers of many of these products [1–3]. One of the places that emerged as the main place of consumption are the gyms [4, 5]. The term nutritional supplement has been popularly used to describe any product (other than tobacco) that is intended to supplement the diet that contains one or more dietary supplements [6]. Dietary supplements are used in foods and beverages [7-9]. They are not intended to replace food [10]. Nutritional supplements can be traditionally classified into three essential parts; dietary supplements like vitamins, minerals, and antioxidants, the ergogenic supplement like the coenzyme Q10, BCAA, and caffeine and sports food like sports drinks [11-13]. According to the United States of America Food and Drug Administration (FDA) any product labeled as a "supplement" means that its contents and the claims on the label have not been approved or evaluated by the FDA [14, 15]. It is well documented that the use of some of these products may lead to serious health injury [16]. The regular gym users are at risk resulting from taking various categories of nutritional supplements intended for athletic improvement [17]. The Kingdom of Saudi Arabia has an expanding population in which the young constitute the majority, with an increasing number of people attending athletic activities and with easy access to dietary supplements [18]. An increasing number of gym exercisers are eager to take dietary supplements in order to increase lean body mass quickly [19], but without the advice provided by health professionals that athletes have available [5]. They often rely only on the information on the label, which may not be fully representative of the actual content of the supplement [19], or on the information provided by the manufacturer, that does not have to demonstrate the supplements' safety and efficacy [20]. Although there is much information on the use of dietary supplements by athletes [21, 22], however, little is known about supplement intake among people exercising in gyms. The use of dietary supplements by gym exercisers appears to be influenced by their country [4, 23-26] and culture [27], therefore it is necessary to provide population-specific data on nutritional supplement use in gym exercisers, and allow for targeted strategies to be drawn. Thus this study was conducted to explore the pattern, determinants and use of nutritional and hormonal supplements, among gym exercisers, and study their awareness about side effects of use of steroids.

Subjects and Methods

The design of this study was a cross-sectional one; where an online survey using Google form questionnaire, was sent via email to the residents of Jeddah, Saudi Arabia. Sampling method was a non-probability convenient one. Sample size for the present study was determined using G*power software [13] ($\alpha = 0.05$, Power = 0.95, effect size = 0.3 and degree of freedom = 5), where the minimal sample size required was 224. The total number of subjects who responded was 260 (age: 17 years through to 69 years). Data was collected using the questionnaire which included the following sections: Personal questionnaire which provided information about socio demographic characteristics, hobbies, and habits; information about type, nature and duration of playing sports; information about use of nutritional supplementation, and hormones; and awareness of side effects of hormones. Data analysis and statistical tests: Statistical Package for Social Sciences (IBM SPSS, version 23, Armonk, NY: IBM Corp.) was used. Chi square test of significance and Multi-nominal Logistic regression method were used; Odds ratios (OR), 95% confidence interval (95% CI), and p values were calculated. The level of significance (α) was 0.05.

Ethical considerations

Ethical clearance was obtained from the institutional review board (IRB). In order to keep confidentiality of any information provided by study participants, the data collection procedure was anonymous. Availability of the data: the raw data is available at the research center of ISNC and all results of the data are included in the paper.

Results

The total number of gym exercisers was 260. They were practicing exercises in gyms at Northern Jeddah (41.2%), Western Jeddah (18.1%), Central Jeddah (15.8%), Eastern Jeddah (16.9%) and at Southern Jeddah (8.1%). The age range of the exercisers was 17 to 69 years, with mean age of 29.9 years (SD 11.37). Out of the 260 exercisers, 43.1% were males and 56.9% were females. Among the studied exercisers, 59.1% used nutritional supplements. Those who have ever used steroids were 6.2% of the exercisers. The majority of the exercisers (68%) took nutritional supplements without consultation of health care experts; while 20% took them on recommendation of their coaches. Health care experts were consulted on nutritional supplements by 12% of the exercisers. Over half of the exercisers used them to build muscles (52.6%), while 22.2% used them to improve performance. On the other hand, 16.3% used them to reduce weight. Over half of the exercisers admitted that they obtained the desired effect from the use of the nutritional supplements, while 8% admitted that they suffered from their side effects. Table 1 shows the distribution of exercisers by age groups according to personal characteristics, and frequency and duration of training. The majority of subjects were of normal BMI (48.1%), or overweight/obese (46%). Those who are under 20 years of age tended to be normal (56.7%), or underweight (20.0%). Overweight was mainly encountered among those aged 50 to less than 60 years (65.5%), while obese subjects were more encountered among those aged 40 to less than 50 years (53%). These differences were statistically significant where $p < 0.05$. The majority of the subjects had total period of training of 1 – 6 months (46.5%). Those subjects aged 20 to 30 years have practiced training for more than 12

months (49.4%), while those aged 50 to 60 years had the shortest period of training (69.0%). These differences were statistically significant where p <0.002. The majority of the subjects spend 3- 5 hours training per day (63.8%), and for 3 -5 times per week (50%). Younger age groups spent more time per day and more days per week in training (p< 0.05). Table 2 displays relationship between BMI categories and sociodemographic characteristics and intake of nutritional supplements and hormones. The proportion of females was higher than males in this study (56.9% and 43.1% respectively). The proportion of subjects who were overweight or obese (51.2, and 52.9% respectively) were higher in males; whereas the proportion of U/W subjects was higher among females (80.0%). The majority of the studied subjects were Saudis (89.2%). About three quarters of the subjects were non-smokers (75.8%). The majority of the subjects were university degree holders or higher (87.3%). Half of the subjects used nutritional supplements (50%), whereas, 6.2%, only, ever had cortisol. Table 3 shows the awareness of the subjects about side effects of cortisol and BMI. The majority of the subjects (49.2%) did not know that cortisol is associated with increased occurrence of hypertension, or associated with increased blood glucose level (51.2%), or its association with vision problems (57.3%), prostate enlargement(52.7%), kidney problem (43.1%)), testicular atrophy (49.6%), or with increased RBCs (54.2%). BMI of the subjects was irrelevant to their awareness about these side effects (p > 0.05). Although the majority did not know that cortisol could produce gynecomastia (40.4%), a high proportion of those who were overweight (35.3%) realized this association. This difference was statistically significant where p <0.029. A large proportion of those who were underweight realized that cortisol could produce psychological upset (53.3%). This difference was statistically significant where p <0.019. Table 4 reveals the distribution of subjects by BMI and type and frequency of nutritional supplements used. The type of nutritional supplement used 4 times per day were sports drinks (44.4%), carbohydrate rich supplements (43.0%), creatine (39.3%), vitamins/minerals (25.2%), fat burning substances (50.4%), and weight gain substances (52.6%). However, no significant differences were found between different categories of BMI and intake of nutritional supplements (p > 0.05). Table 5 shows the results of logistic regression relationship of the variables which are related to the use of nutritional supplements. Older age groups were significantly more likely to use nutritional supplements compared to the younger ones (B= - 0.058; p < 0.000). The males were 2.985 times more likely to consume nutritional supplements compared to females (OR= 2.985; 95% CI 1.575, 5.660, p < 0.001). The smokers were 3.541 times more likely to consume nutritional supplements compared to the nonsmokers (OR= 3.541; 95% CI 1.713, 7.313, p < 0.001). The subjects with total period of training of more than 12 months, were significantly more likely to consume nutritional supplements compared to those with a total period of 1 – 6 months (OR= 0.413; 95% CI 0.202, 0.845, p < 0.016), and those with a total period of 7-12 months (OR= 0.308; 95% CI 0.126, 0.775, p < 0.016). The subjects with a total period of training per day of more than 2 hours, were significantly more likely to consume nutritional supplements compared to those with a total period of less than 1 hour per day (OR= 0.045; 95% CI 0.004, 0.845, p < 0.570, p < 0.017), and those with a total period of 1 - 2 hours per day (OR= 0.083; 95% CI 0.007, 0.997, p < 0.050).

Discussion

This study allowed us to explore the use of nutritional supplements by exercisers in the five districts of Jeddah city, Saudi Arabia. The proportions of males and females who practice exercises were similar with no significant differences, however, BMI was significantly different, where females tended to be underweight, while obesity was more common among males. In the present study, the BMI of the exercisers was not associated with intake of nutritional supplements, or with the type of supplement used. This is consistent with another study [17]. In the present study, we found that the total period of training, and number of hours of training per day were significant determinants of use of nutritional supplements among gym goers. This is consistent with findings from another study [29]. In the present study we found that older gym goers, and male gender, as well as smoking, were significantly more likely to use nutritional supplements (using multinomial logistic regression). This was in line with a previous study [5]; however, it was not in line with another study [29]. In the present study over 59% of the Gym exercisers used nutritional supplements. This is in line with the majority of the studies conducted in different parts of the world, which revealed prevalence ranging from 36% to 80% [5, 19, 24, 29 - 30]. The discrepancies in the reported prevalence rates may be related to sociodemographic and cultural characteristics, the type of gyms included or methodologic aspects, namely what was considered to be a supplement, and the method of data acquisition [23]. A previous study revealed that the more years of experience, the greater the belief that diet is insufficient to cover the requirements associated with exercise [32]. This indicates the relationship that could exist between the years of training and the use of nutritional supplements, a similar situation to that shown by gym-exercisers in the present study. Regarding the characteristics of the used nutritional supplements, the six most used nutritional supplements were sports drinks, carbohydrate rich supplements, creatine, vitamins/minerals, fat burning substances, and weight gain substances. This is in line with reports from studies conducted on gym exercisers in Saudi Arabia and in other regions [24, 31, 33], which found a high use of amino acids, proteins, and multivitamins. This finding can be explained by the importance, that optimal protein intake, has in increasing muscle mass [34], and the convenience of supplements [35]. It is not always feasible to ingest an adequate amount of protein exclusively from food, due to difficulties in preparation or transportation, lack of time or the volume needed to reach optimal doses [36]. Supplements also represent an easy way to increase protein intake in out-of-home snacks, promoting a more equitable distribution throughout the day, with advantages for muscle synthesis [37].

Table 1: Distribution of the Gym trainee subjects according to Age groups and BMI, and training periods

Variables	Categories	Age groups in years							P - value
		< 20 No (%)	20 - No (%)	30 - No (%)	40 - No (%)	50 - No (%)	60 + No (%)	Total No (%)	
Use of nutritional supplements	Yes	13 .43,3%	105 63.3%	8 50,0%	4 26.7%	5 17.2%	0 0.0%	135 51.9%	0.000
	No	17 56.7%	61 36.7%	8 50.0%	11 73.3%	24 82.8%	4 100.0%	125 48.1%	
BMI	Under weight	6 (20.0%)	9 (5.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	15 (5.8%)	0.000
	Normal	17 (56.7%)	99 (59.6%)	2 (12.5%)	1 (6.7%)	6 (20.7%)	0 (0.0%)	125 (48.1%)	
	Overweight	5 (16.7%)	44 (26.5%)	10 (62.5%)	6 (40.0%)	19 (65.5%)	2 (50.0%)	86 (33.1%)	
	Obese	2 (6.7%)	14 (8.4%)	4 (25.0%)	8 (53.3%)	4 (13.8%)	2 (50.0%)	34 (13.1%)	
Total period of training	1-6 months	20 (66.7%)	62 (37.3%)	9 (56.3%)	8 (53.3%)	20 (69.0%)	2 (50.0%)	121 (46.5%)	0.002
	7-12 months	7 (23.3%)	22 (13.3%)	2 (12.5%)	2 (13.3%)	5 (17.2%)	0 (0.0%)	38 (14.6%)	
	more than 12 months	3 (10.0%)	82 (49.4%)	5 (31.3%)	5 (33.3%)	4 (13.8%)	2 (50.0%)	101 (38.8%)	
Training times per week	less than 3 times	13 (43.3%)	45 (27.1%)	3 (18.8%)	7 (46.7%)	22 (75.9%)	0 (0.0%)	90 (34.6%)	0.000
	3-5 time	15 (50.0%)	92 (55.4%)	10 (62.5%)	4 (26.7%)	5 (17.2%)	4 (100.0%)	130 (50.0%)	
	more than 5 times	2 (6.7%)	29 (17.5%)	3 (18.8%)	4 (26.7%)	2 (6.9%)	0 (0.0%)	40 (15.4%)	
Total training hours per day	less than 1 hour	10 (33.3%)	47 (28.3%)	0 (0.0%)	7 (46.7%)	18 (62.1%)	2 (50.0%)	84 (32.3%)	0.003
	1-2 hours	20 (66.7%)	110 (66.3%)	16 (100.0%)	8 (53.3%)	10 (34.5%)	2 (50.0%)	166 (63.8%)	
	3-5 hours	0 (0.0%)	9 (5.4%)	0 (0.0%)	0 (0.0%)	1 (3.4%)	0 (0.0%)	10 (3.8%)	
Gender	Males	3 10.0%	91 54.8%	10 62.5%	4 26.7%	2 6.9%	2 50.0%	112 43.1%	0.000
	Females	27 90.0%	75 45.2%	6 37.5%	11 73.3%	27 93.1%	2 50.0%	148 56.9%	

Table 2: Distribution of the Gym trainee subjects according to BMI and personal characteristics

Variables	Categories	BMI categories					P -value
		U/W No (%)	Normal No (%)	O/W No (%)	Obese No (%)	Total No (%)	
Gender	Male	3 (20.0%)	47 (37.6%)	44 (51.2%)	18 (52.9%)	112 (43.1%)	0.038
	Female	12 (80.0%)	78 (62.4%)	42 (48.8%)	16 (47.1%)	148 (56.9%)	
Nationality	Saudi	15 (100.0%)	111 (88.8%)	76 (88.4%)	30 (88.2%)	232 (89.2%)	0.586
	Non-Saudi	0 (0.0%)	14 (11.2%)	10 (11.6%)	4 (11.8%)	28 (10.8%)	
Smoking Status	Smokers	2 (13.3%)	31T (24.8%)	22 (25.6%)	8 (23.5%)	63 (24.2%)	0.780
	Non-smokers	13 (86.7%)	94 (75.2%)	64 (74.4%)	26 (76.5%)	197 (75.8%)	
Level of education	Lower secondary school	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.9%)	1 (0.4%)	0.106
	Higher secondary school	2 (13.3%)	15 (12.0%)	8 (9.3%)	7 (20.6%)	32 (12.3%)	
	University	13 (86.7%)	103 (82.4%)	75 (87.2%)	23 (67.6%)	214 (82.3%)	
	Master	0 (0.0%)	7 (5.6%)	3 (3.5%)	2 (5.9%)	12 (4.6%)	
	Doctorate	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.9%)	1 (0.4%)	
Use of nutritional supplement	Yes	5 (33.3%)	67 (53.6%)	41 (47.7%)	17 (50.0%)	130 (50.0%)	0.475
	No	10 (66.7%)	58 (46.4%)	45 (52.3%)	17 (50.0%)	130 (50.0%)	
Use of cortisol	Yes, on an ongoing basis	2 (13.3%)	1 0.8%	5 5.9%	1 2.9%	9 3.5%	0.065
	I used it and stopped using	0 0.0%	5 4.0%	2 2.4%	0 0.0%	7 2.7%	
	May use it in the future	1 6.7%	25 20.0%	20 23.5%	3 8.6%	49 18.8%	
	I cannot use it	12 80.0%	94 75.2%	58 68.2%	31 88.6%	195 75.0%	

Table 3: Distribution of the Gym trainee subjects according to BMI and awareness of steroid use complication

Variables	Categories	BMI categories					P-value
		U/W No (%)	Normal No (%)	O/W No (%)	Obese No (%)	Total No (%)	
S/E: Hypertension	Yes	4 (26.7%)	35 (28.0%)	30 (34.9%)	6 (17.6%)	75 (28.8%)	0.151
	No	3 (20.0%)	22 (17.6%)	19 (22.1%)	13 (38.2%)	57 (21.9%)	
	I don't know	8 (53.3%)	68 (54.4%)	37 (43.0%)	15 (44.1%)	128 (49.2%)	
S/E: Increase blood sugar level	Yes	5 (33.3%)	35 (28.0%)	18 (20.9%)	6 (17.6%)	64 (24.6%)	0.067
	No	1 (6.7%)	26 (20.8%)	21 (24.4%)	15 (44.1%)	63 (24.2%)	
	I don't know	9 (60.0%)	64 (51.2%)	47 (54.7%)	13 (38.2%)	133 (51.2%)	
S/E: Vision problems	Yes	2 (13.3%)	29 (23.2%)	18 (20.9%)	11 (32.4%)	60 (23.1%)	0.168
	No	0 (0.0%)	27 (21.6%)	16 (18.6%)	8 (23.5%)	51 (19.6%)	
	I don't know	13 (86.7%)	69 (55.2%)	52 (60.5%)	15 (44.1%)	149 (57.3%)	
S/E: Psychological problems	Yes	8 (53.3%)	48 (38.4%)	42 (48.8%)	10 (29.4%)	108 (41.5%)	0.019
	No	0 (0.0%)	23 (18.4%)	12 (14.0%)	13 (38.2%)	48 (18.5%)	
	I don't know	7 (46.7%)	54 (43.2%)	32 (37.2%)	11 (32.4%)	104 (40.0%)	
S/E: Prostate enlargement	Yes	1 (6.7%)	23 (18.4%)	25 (29.1%)	7 (20.6%)	56 (21.5%)	0.186
	No	6 (40.0%)	28 (22.4%)	22 (25.6%)	11 (32.4%)	67 (25.8%)	
	I don't know	8 (53.3%)	74 (59.2%)	39 (45.3%)	16 (47.1%)	137 (52.7%)	
S/E: Kidney problems	Yes	5 (33.3%)	46 (36.8%)	39 (45.3%)	12 (35.3%)	102 (39.2%)	0.064
	No	1 (6.7%)	21 (16.8%)	12 (14.0%)	12 (35.3%)	46 (17.7%)	
	I don't know	9 (60.0%)	58 (46.4%)	35 (40.7%)	10 (29.4%)	112 (43.1%)	
S/E: Testicular atrophy	Yes	3 (20.0%)	27 (21.6%)	26 (30.2%)	8 (23.5%)	64 (24.6%)	0.255
	No	4 (26.7%)	29 (23.2%)	20 (23.3%)	14 (41.2%)	67 (25.8%)	
	I don't know	8 (53.3%)	69 (55.2%)	40 (46.5%)	12 (35.3%)	129 (49.6%)	
S/E: Gynecomastia	Yes	2 (13.3%)	39 (31.2%)	28 (32.6%)	12 (35.3%)	81 (31.2%)	0.026
	No	10 (66.7%)	30 (24.0%)	22 (25.6%)	12 (35.3%)	74 (28.5%)	
	I don't know	3 (20.0%)	56 (44.8%)	36 (41.9%)	10 (29.4%)	105 (40.4%)	
S/E: Increased RBCs	Yes	3 (20.0%)	23 (18.4%)	27 (31.4%)	9 (26.5%)	62 (23.8%)	0.123
	No	2 (13.3%)	24 (19.2%)	21 (24.4%)	10 (29.4%)	57 (21.9%)	
	I don't know	10 (66.7%)	78 (62.4%)	38 (44.2%)	15 (44.1%)	141 (54.2%)	

Table 4: Distribution of the Gym trainee subjects according to BMI and awareness of steroid use complication

Types of nutrition supplements	Categories	BMI categories					P –value
		U/W No (%)	Normal No (%)	O/W No (%)	Obese No (%)	Total No (%)	
Sports drinks times per day	≤ 1	4 (80.0%)	33 (47.8%)	22 (50.0%)	10 (58.8%)	69 (51.1%)	0.851
	2-4	0 (0.0%)	3 (4.3%)	2 (4.5%)	1 (5.9%)	6 (4.4%)	
	>4	1 (20.0%)	33 (47.8%)	20 (45.5%)	6 (35.3%)	60 (44.4%)	
Carbohydrate-rich supplements Times per day	≤ 1	4 (80.0%)	27 (39.1%)	17 (38.6%)	9 (52.9%)	57 (42.2%)	0.434
	2-4	0 (0.0%)	10 (14.5%)	9 (20.5%)	1 (5.9%)	20 (14.8%)	
	>4	1 (20.0%)	32 (46.4%)	18 (40.9%)	7 (41.2%)	58 (43.0%)	
Creatine Times per day	≤ 1	94 (80.0%)	34 (49.3%)	26 (59.1%)	10 (58.8%)	74 (54.8%)	0.818
	2-4	0 (0.0%)	4 (5.8%)	3 (6.8%)	1 (5.9%)	8 (5.9%)	
	>4	1 (20.0%)	31 (44.9%)	15 (34.1%)	6 (35.3%)	53 (39.3%)	
Vitamins / Minerals Times per day	≤ 1	4 (80.0%)	43 (62.3%)	31 (70.5%)	10 (58.8%)	88 (65.2%)	0.915
	2-4	0 (0.0%)	8 (11.6%)	3 (6.8%)	2 (11.8%)	13 (9.6%)	
	>4	1 (20.0%)	18 (26.1%)	10 (22.7%)	5 (29.4%)	34 (25.2%)	
Fat burning supplements Times per day	≤ 1	4 (80.0%)	32 (46.4%)	22 (50.0%)	6 (35.3%)	64 (47.4%)	0.635
	2-4	0 (0.0%)	1 (1.4%)	1 (2.3%)	1 (5.9%)	3 (2.2%)	
	>4	1 (20.0%)	36 (52.2%)	21 (47.7%)	10 (58.8%)	68 (50.4%)	
Weight gain supplements Times per day	≤ 1	4 (80.0%)	28 (40.6%)	18 (40.9%)	8 (47.1%)	58 (43.0%)	0.346
	2-4	0 (0.0%)	5 (7.2%)	0 (0.0%)	1 (5.9%)	6 (4.4%)	
	>4	1 (20.0%)	36 (52.2%)	26 (59.1%)	8 (47.1%)	71 (52.6%)	

Table 5: Multinomial Logistic Regression for using nutritional supplements and related variables

Variable	Categories	B	Sig	Exp (B)	95% CI for Exp (B)	
					Lower bound	Upper Bound
Intercept		4.158	.002			
Age in years		-.058	.000	.944	.916	.973
Gender	Male	1.094	.001	2.985	1.575	5.660
	Female	0				
Smoking	Yes	1.265	.001	3.541	1.713	7.323
	No	0				
Total period of training	1-6 months	-.883	.016	.413	.202	.845
	7-12 months	-1.178	.010	.308	.126	.755
	more than 12 months	0				
Total training hours per day	less than 1 hour	-3.096	.017	.045	.004	.570
	1-2 hours	-2.489	.050	.083	.007	.997
	more than 2 hours	0				

When we explored the reason why the gym exercisers use nutritional supplements, these were mainly to gain muscle mass (52.6%), improve performance (22.2%), and reduce body fat (16.3%). This was in line with other studies [17, 29]. Use of hormones among the gym exercisers was low (3.9%), which is similar to another study [17]; thus the information on this type of supplement was not enough to reveal its characteristics. However, the information about side effects of use of corticosteroids was poor among the majority of the gym exercisers in the present study. In general, the results of the present study, showed that, gym exercisers were seeking to meet goals that were more associated with fitness and aesthetics rather than sport performance. These results are in line with those found in other, similar investigations [17, 24, 32]. The fact that 53% of exercisers use nutritional supplements raises the question whether, in actual fact, so many individuals actually have an unbalanced diet, making it necessary to ingest these supplements in order to cover the nutrient deficiency, as there is sufficient evidence to indicate that the physically active population does not require additional nutrients to those provided by a balanced diet [34], or whether, in actual fact, marketing and a lack of knowledge, leads them to ingest products that they probably do not need. Added to the above, only 11% of exercisers state that the use of nutritional supplements was recommended by health care personnel or an expert nutritionist. Similarly to what was previously reported [5, 19, 29], the present study revealed that, there was a high dependence on the internet as a source of information and place of purchase. This scenario could contribute to a greater use of nutritional supplements with little scientific evidence or, even worse, the use of nutritional supplements that could represent a health risk. This question takes on even more importance if it is considered that 50% of the nutritional supplements consumed by exercisers are classified as type C (little meaningful proof of beneficial effects), according to the sports supplement program of the Australian Institute of Sport, a result that is lower than the 57.9% reported by one study [32].

In conclusion, consumption of nutritional supplements is large among gym exercisers in Saudi Arabia, mainly men; however, the majority use it without medical supervision. Sports drinks, carbohydrate rich supplements, creatine, vitamins/minerals, fat burning substances, and weight gain substances, were the most consumed supplements. Gaining muscle mass, improving performance, and reducing weight are the main reasons for consuming them. This generalized consumption of supplements occurs despite the scarce evidence of their effects and the lack of knowledge of pre-existing nutritional deficiencies. This study establishes a baseline for future investigations related to the use and intake of nutritional supplements among recreational gym exercisers, in Jeddah Saudi Arabia. Health education programs are needed where sports nutrition experts should provide scientifically correct information about the benefits and risks of using supplements, so that consumers can make informed choices, and encourage the role of a balanced diet in achieving their specific goals. Educating gym employees may have a positive influence on the use of supplements and hormones among gym exercisers.

Limitations

Our study has inherent limitations, which should be acknowledged, the main one concerning the method of data collection (a self-administered online questionnaire) and the sample being of convenience. Furthermore, participants use the internet, so results may not reflect the views of those unfamiliar with the internet, and living in very remote regions and living traditional / nomadic lifestyles. Despite these limitations, our results have generated important information on nutritional supplement intake among Saudi exercisers, an otherwise unexplored area of health care.

Acknowledgements

This work was supported by the College of Ibn Sina National College for medical studies, Jeddah, KSA. The authors thank the faculties at ISNC who reviewed and approved the proposal of this study. Our thanks also go to all gym exercisers who agreed to be part of this research.

References

[1] Burke L, Cort M, Cox G, Crawford R, Desbrow B, Farthing L, et al. Supplements and sports foods. In: Burke L, Deakin V, editors. Clinical sports nutrition. 3rd ed. Sydney, Australia: McGraw-Hill; 2006. p. 485–579.

[2] Erdman KA, Fung TS, Reimer RA. Influence of performance level on dietary supplementation in elite Canadian athletes. Med Sci Sports Exerc 2006; 38:349–56.

[3] Huang SS, Johnson K, Pipe AL. The use of dietary supplements and medications by Canadian athletes at the Atlanta and Sydney Olympic Games. Clin J Sport Med 2006;16:27–33.

[4] Lacerda FMM, Carvalho WRG, Hortegal EV, Cabral NAL, Veloso HJF. Factors associated with dietary supplement use by people who exercise at gyms. Revista de saude publica 2015; 49: 63.

[5] El Khoury D, Antoine-Jonville S. Intake of nutritional supplements among people exercising in gyms in Beirut City. J Nutr Metab. 2012; 2012:703490.

[6] DSHEA, Dietary Supplement Health and Education Act of 1994. Pub L No103-417, 108 Stat 4325, 994.

[7] Nagdalian A A, Pushkin S V, Lodygin A D, Timchenko L D, Rzhepakovsky I V, Trushov P A. Bioconversion of Nutrients and Biological Active Substances in Model Systems Chlorella-Insect-Livestock. Entomol. Appl. Sci. Lett. 2018; 5(1): 103-10.

[8] Shahriyari F, Askari G R, Sadeghianshahi M R, Ebadi Asl H, Sharifatpour R, Abbasi H. The effect of Aerobic exercise and Malva Sylvestris supplements on the lipid profile, glucose and WHR in obese and inactive women. J. Adv. Pharm. Edu. Res. 2018; 8(S2): 121- 128.

[9] Lebed S, Nemchenko A, Nazarkina V. Actuality of the implementation of international practice in proliferation of counterfeit medicines involving Interpol. J. Adv. Pharm. Edu. Res. 2020; 10(2): 52-59.

[10] Arshad S, Aslam R, Tufail H M B, Alvi A M, Anwar F, Sajjad M. A survey of self-medication with dietary supplements among pharmacy students of Punjab, Pakistanr. Pharmacophores. 2017; 8(5): 10-17.

[11] Tian H H, Ong W S, Tan C. Nutritional supplement use among university athletes in Singapore. Singapore Med J 2009; 50 (2): 165.

[12] Ruano, J., Teixeira, V.H. Prevalence of dietary supplement use by gym members in Portugal and associated factors. J Int Soc Sports Nutr 17, 11 (2020). https://doi.org/10.1186/s12970-020-00342-z

[13] Juhn, M. S. Popular sports supplements and ergogenic aids. Sports Medicine, 2003 ; 33(12), 921–939.

[14] Young C., Oladipo O., Frasier S., Putko R., Chronister S., Marovich M. Hemorrhagic stroke in young healthy male following use of sports supplement Jack3d. Military Medicine. 2012; 177 (12) :1450–1454. doi: 10.7205/milmed-d-11-00342.

[15] DSHEA. Dietary Supplement Health and Education Act of 1994. Pub L No103-417, 108 Stat 4325, 994, https://ods.od.nih.gov/About/DSHEA_Wording.aspx.

[16] Jenkinson D. M., Harbert A. J. Supplements and sports. American Family Physician. 2008; 78 (9):1039–1046.

[17] Sánchez O., Miranda M., Guerra-Hernández E. Prevalence of protein supplements use at gyms. Nutrición Hospitalaria.2011; 26:1168–1174.

[18] Central Department of Statistics and Information. Population (15 Years and Over) By Age Groups and Educational Status: 1434 H/2013D. https://www.stats.gov.sa/en.

[19] Goston JL, Correia MI. Intake of nutritional supplements among people exercising in gyms and influencing factors. Nutrition. 2010;26 (6):604–11.

[20] Garthe I, Maughan RJ. Athletes and supplements: prevalence and perspectives. Int J Sport Nutr Exerc Metab. 2018;28(2):126–38.

[21] Knapik JJ, Steelman RA, Hoedebecke SS, Austin KG, Farina EK, Lieberman HR. Prevalence of dietary supplement use by athletes: systematic review and meta-analysis. Sports Med. 2016; 46 (1):103–23.

[22] Baltazar-Martins G, Brito de Souza D, Aguilar-Navarro M, Munoz-Guerra J, MDM P, Del Coso J. Prevalence and patterns of dietary supplement use in elite Spanish athletes. J Int Soc Sports Nutr. 2019; 16 (1): 30.

[23] 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 Dietary Suppl. 2018; 15 (1):88–97.

[24] Alshammari SA, AlShowair MA, AlRuhaim A. Use of hormones and nutritional supplements among gyms' attendees in Riyadh. J Fam Community Med. 2017; 24 (1):6.

[25] 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: 9219361 / https://doi.org/10.1155/2017/9219361

[26] Abo Ali EA, Elgamal HH. Use of dietary supplements among gym trainees in Tanta city, Egypt. J Egypt Public Health Assoc. 2016;91 (4): 185–91.

[27] Maughan RJ, Shirreffs SM, Vernec A. Making decisions about supplement use. Int J Sport Nutr Exerc Metab. 2018; 28 (2):212–9.

[28] Faul F, Erdfelder E, Lang A-G, Buchner A. G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods. 2007; 39 (2), 175-191.

[29] Espinosa I, Huerta L, Lobos A, Aguilera C. Analysis of the use of nutritional supplements in gyms in Coquimbo, Chile Arch Med Deporte 2018; 35 (6): 369 - 375

[30] Morrison LJ, Gizis F, Shorter B. Prevalent use of dietary supplements among people who exercise at a commercial gym. Int J Sport Nutr Exerc Metab. 2004; 14: 481–92.

[31] Rodríguez F, Crovetto M, González A, Morant N, Santibañez F. Nutritional supplement intake in gymnasium, consumer profile and characteristics of their use. Rev Chil Nutr. 2011; 38:157–66.

[32] Jorquera Aguilera C, Rodríguez-Rodríguez F, Torrealba Vieira MI, Campos Serrano J, Gracia Leiva N. Consumo, características y perfil del consumidor de suplementos nutricionales en gimnasios de Santiago de Chile. Rev Andal Med Deporte. 2016; 9: 99 –104.

[33] Maughan RJ, Depiesse F, Geyer H. The use of dietary supplements by athletes. J Sports Sci. 2007; 25 (Suppl) 1: S103–13.

[34] Morton RW, Murphy KT, McKellar SR, Schoenfeld BJ, Henselmans M, Helms E, et al. A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training-induced gains in muscle mass and strength in healthy adults. Br J Sports Med. 2018; 52 (6): 376–84.
[35] Sv V, Beals JW, Martinez IG, Skinner SK, Burd NA. Achieving optimal post-exercise muscle protein remodeling in physically active adults through whole food consumption. Nutrients. 2018; 10 (2):224.
[36] Moore DR, Churchward-Venne TA, Witard O, Breen L, Burd NA, Tipton KD, et al. Protein ingestion to stimulate myofibrillar protein synthesis requires greater relative protein intakes in healthy older versus younger men. J Gerontol A Biol Sci Med Sci. 2015; 70 (1): 57–62.
[37] Mamerow MM, Mettler JA, English KL, Casperson SL, Arentson-Lantz E, Sheffield-Moore M, et al. Dietary protein distribution positively influences 24-h muscle protein synthesis in healthy adults. J Nutr. 2014; 144 (6): 876–80.