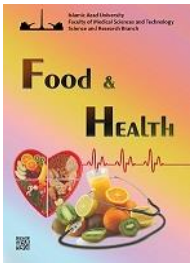

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Investigation and comparison of anthropometric indices, dietary habits, knowledge, attitude, and practice of sports club's members of sports supplements consumption in five regions of Tehran

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ABSTRACT

This study was aimed to investigate the knowledge, attitude, and practice of sports club members as well as to conduct anthropometric measurements and dietary habits assessments. The study population consisted of members of sports clubs. The socio-economic status (SES) questionnaire, demographic information, dietary habits questionnaire, questionnaire of knowledge, attitude, and practice on sports supplements, anthropometric measurements, and physical activity questionnaires were investigated. Knowledge, attitude, and practice of sports clubs' members were reported to be low in the sense that both men and women practiced bodybuilding more than other sports in all five regions of Tehran. Men and women reported exercising for fitness and weight loss respectively. Men took supplements to gain muscle mass while took them women more for weight loss. Protein and carbohydrate, branched-chain amino acid (BCAA), fiber, anabolic steroids, glutamine, arginine, and antioxidant supplements were consumed more frequently by men. The consumption rate of the supplement was high amongst the members of sports clubs; however, their knowledge and attitude were low. Additionally, the dietary habits of subjects were not suitable and their physical activity was not proper. According to anthropometric data, the prevalence of overweight and obesity was high. Regarding what is mentioned above, the authorities are required to include such issues in large-scale policies.

1. Introduction

With the advancement of exercise physiology, metabolism, and nutrition, it has been proved that athletes' performance is affected by diet and nutritional intakes. Although some athletes consider that supplements can benefit them, it is not scientifically proved (1). As dietary supplement use has grown significantly in the past years, the supplement manufacturing and sales industry has grown dramatically in a manner that the supplement sales in the United States exceeds $17 billion annually (2). Dietary supplements are beneficial for those athletes that are of a high level of physical activity. However, the nutritional needs of non-professional athletes can be met through basic nutrition principles (3). Notwithstanding the overuse of several types of dietary supplements can be seen among athletes who do not need to take such supplements, the efficacy of some of them has not to be proven in the face of claims made by their manufacturers or their excessive consumption can lead to complications such as gout, dehydration and low bone mass (4). According to Nosratpour study (5), a significant percentage of athletes, especially men, had a history of taking supplements. The results suggested that 88% of bodybuilders and 76% of wrestlers consumed sports supplements. Moreover, the knowledge level of bodybuilders was significantly higher than that of wrestlers. In his study, Al-Husseini (6) reviewed the effect of nutrition on athletes and found that correct workout nutrition is the one that provides the body with the required energy during physical activity. The results of this study indicated that nutrition along with exercise played an important role in improving athletic performance. In a study by Owens et al. (7), it was found that 71.5% of people took supplements to maintain their health and only a small

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percentage of people understood the side effects and interactions of supplements with medications. According to Qidwai et al. (8), 79% of subjects found supplementation helpful while the others did were not on the same side. Sharma et al. (9) conducted a study among medical students in India and found that the most common reasons for taking supplements are to be healthy and be sure of the provision of vitamins. In a study by Alhomoud (10), two-thirds of participants suggested that the best way to get nutrients was the simultaneous consumption of food and supplements. In Iran, over the past few decades, we have seen significant increases in the consumption of various supplements as vitamins and nutritional supplements, weight loss, and muscle-building drugs. A wide variety of supplements has been available in all pharmacies in Iran. On the other hand, fraudulent and smuggled supplements which are occasionally not approved by the Ministry of Health, are used by athletes in clubs (11). In recent years, there have been some sporadic studies on nutritional and pharmaceutical supplements in Iran that have been mainly focused on specific groups or supplements, and no serious study has been conducted on the members of the sports club's members (12). Accordingly, a comprehensive study which may account for the knowledge, attitude, and practice of sports clubs' members of sports and dietary supplements consumption for weight change or body fitness seems necessary. This cross-sectional descriptive study was conducted in five regions of Tehran including north, south, east, west, and center, and aimed to investigate the knowledge, attitude, and practice of sports clubs members regarding sports supplements consumption, as well as dietary habits, anthropometric measurements, dose and type of supplementation consumed and level of physical activity.

2. Material and methods

This was a descriptive cross-sectional study, which employed physical activity questionnaires, SES questionnaire and questionnaire of knowledge, attitude, and practice on sports supplements as well as anthropometric measurements and dietary habits assessments of project participants. The statistical population consisted of members of sports clubs. Possible samples were selected by cluster sampling method. In this regard, Tehran was divided into five regions: north, south, east, and west. Then two women and men clubs were selected from each region and the samples were selected randomly from them. The sample size was determined by using GPower version 3.1.9.2 software with a probability of loss of 65 subjects in each group. As five regions and both males and females participate in this study, a total of 10 groups consisting of 650 subjects were examined. A researcher-made questionnaire was employed to assess subjects' dietary habits during the past year. This 82-item questionnaire, which was scored along with the Likert scale format, was first distributed among 100 people, and then it was compared with the FFQ questionnaire. Statistical tests were performed to assess the validity and reliability of the dietary habits questionnaire. Cronbach's alpha of 0.78 indicated the internal consistency of questions (13). Subjects' general information including age, occupation, education level, smoking, alcohol, history of taking sports, vitamin and mineral supplements, and history of various diseases such as gastrointestinal, cancer, kidney, liver, etc. were collected through a general questionnaire and interview. The level of physical activity of each participant was assessed by using the Beck International Physical Activity Questionnaire. Beck standard questionnaire, the validity, and reliability of which have been confirmed, was performed to assess the level of physical activity (14). In a researcher-made questionnaire, questions targeted people's knowledge of sports and dietary supplements, their practice and attitudes towards these supplements, the dose of each supplement in mg or number, as well as the brand of the supplements. The SES Questionnaire developed by Qodrat Nama (15) consisting of 5 questions upon parents' education level and status and their ability to buy a house. Subjects' weights were measured and recorded with light clothing and without shoes using the CAMRY scale model EF922. Additionally, the percentages of body fat, muscle, water, and bone mass were measured and recorded by using such scale. The height of subjects was measured using a SECA stadiometer without shoes while shoulders were in normal conditions with an accuracy of 0.5 cm. Body mass index (BMI) is calculated by dividing a person's weight (in kilograms) by his or her height (in meters, squared). The waist was measured at its narrowest part in the state when the subject was at the end of his or her natural exhalation. Following the submission of a letter of introduction to sports clubs for conducting study on consuming sports supplements in 5 regions of Tehran, the samples were selected from volunteers after filling out the form with their personal information and history of the disease. They were randomly assigned to 10 groups. Subsequently, during one session, the subjects were informed about time and place of execution, the duration of the activity, and the manner in which the research was assumed to be performed. Initially, both groups were tested to assess anthropometric measurements, dietary habits, knowledge, attitude, practice, and physical activity following explaining the project and completing the informed consent form. Mean ± standard deviation or median (interquartile range) were employed to describe the quantitative variables, and frequency (percentage) was used to describe the qualitative variables. The Independent t-test or its nonparametric equivalent that is the Mann-Whitney test was used to compare the mean of quantitative outcomes between two groups. Chi-square and Fisher's exact tests were employed to compare the qualitative factors between the two sexes. Suitable regression models were used when comparing the results of two sexes by type of variable. Data analysis was performed by using SPSS 25 software and a p-value <0.05 was considered statistically significant.

3. Results and discussion

According to the findings, the highest percentage of men and women with a Master's degree or higher belonged to the

North and the highest percentage of those with a diploma degree belonged to the South of Tehran. Most of the employed men were in the north (70.3%) and east of Tehran (58.5%), respectively. In addition, most of the employed women (46.2%) were in the east of Tehran. Most single men (79.7%) were in the south and most married men (38.1%) were in the center of Tehran. The majority of single women (56.9%) belonged to the west and the majority of married women (63.1%) belonged to the north of Tehran. The highest socioeconomic status was reported among women in the western region (10%) and the lowest among women in the northern region (60%). Most men and women reported moderate economic status. Also, men in the southern region (60.6%) and women in the north and south (27.7%) reported the highest rate of smoking. The highest rate of alcohol use was reported to be among men in the southern region (60.6%) and the women in the northern region (16.9%), respectively. In all regions, the consumption of sports supplements was reported by 47.4% in men and 46.3% in women. The highest consumption of sports supplements was among men in the south of 56.1% and women in the west of 66.4%. In all regions, the high level of knowledge of the benefits of sports supplements was (13.2%) for men and (5.6%) for women. The highest level of knowledge of the benefits of supplements was among men in the east (20.3%) and women in the west (12.3%). The highest level of knowledge of the disadvantages of sports supplements was 21.8% for men and 0.9% for women. The highest level of knowledge of the disadvantages of supplements was reported among men in the western region (35.4%) and women in the western region (15.4%). Moreover, the highest percentage of suggestion for taking sports supplements was made by trainer, which was reported to be (64.4%) for men and (55.5%) for women. In all Regions, most men exercised for fitness (33.8%) and most women for weight loss (42.1%). Most men stated the purpose of supplementation consumption was to increase muscle mass (36%) and most women to lose weight (33.9%). In a study carried out by Nakhaei and Pakravan (16) on bodybuilders in Rafsanjan city, (77.3%) of men and (25%) of women cited sports performance enhancement as a reason for supplement consumption, and (17.5%) of men and (25%) of women cited health maintenance as a reason for it, which was not consistent with the present study. In a study by Sharma et al. (10), being healthy (about 40%) and making assured of the provision of vitamins (37%) were cited as the most common reasons for taking supplements, which were not in line with the present study due to the differences in the statistical population. Alhomoud (11) found that (39%) of participants consumed dietary supplements. The reason for more than 58% of consumption was to maintain health and for (43%) for ensuring sufficient nutrition. Two-thirds of participants suggested that the best way to intake nutrients was the simultaneous consumption of food and supplements, which was consistent with the present study. This consistency might be a coincidence. The results also indicated that both men (64.9%) and women (33.9%) exercised bodybuilding more than other sports. After bodybuilding, men exercised more swimming and powerlifting (10.5%), and women more aerobic (22.7%). The poorest dietary habits were found among women living in the south and the strongest among women in the north. The nutritional status of the men was mostly moderate and relatively similar in all regions. In their study of 7958 Iranians, Fallah Meshkani et al. (17) found that people who drank a lot of liquids during meals were more likely to be overweight and obese. However, there was no correlation between eating speed, the distance between meals and sleep, and the consumption of fatty foods with overweight and obesity. Ahmadi et al. (18) stated that half of the participants had a diet restriction during the last year. The female participants had no favorable dietary habits, (47.6%) of them did not eat enough vegetables, and (52%) consumed drinks and fast foods that were consistent with our study. In a study of Central American softball players Regarding their knowledge, attitude, and practice, Hornstrom et al. (19) found a strong correlation ($r = –0.23$; $p = 0.002$) between nutritional knowledge and quality of food selected by players. According to the results, the level of physical activity of all subjects was low in all regions. In general, the high level of knowledge was (5.8%) in males and (3.4%) in females. Poor knowledge was (71.4%) in males and (81.4%) in females indicating higher levels of knowledge of males than females. The positive attitude was reported to be (4.9%) in males and (0.3%) in females and negative attitude was reported to be (83.4%) in males and (96.6%) in females, indicating a more positive attitude of males than females. The most positive attitude was found among males in the east (6.3%) and females in the center (1.7%). None of the women in the north, west, south, and east had a positive attitude toward sports supplements. In general, good practice was (3.1%) in men and zero in women. Poor practice in males was (83.7%) and in females (95.9%), indicating the better practice of males than females. In their study of fitness club members in Tehran, Saeedi et al. (20) reported (66.7%) supplements consumption with multivitamins and minerals (43.8%), iron (30.5%), and unauthorized supplements (5%). Baygi et al. (21) surveyed 563 women working in the health sector and reported a (53.8%) prevalence of supplement consumption among them. Alshammari (22) compared the consumption of dietary supplements and hormones and concluded that the consumption of dietary supplements was (47.9%) and that of hormones was (7.9%). Arazi (23) surveyed bodybuilders in Karaj and found that (82.4%) of them consumed supplements, (92.1%) claimed to have sufficient knowledge about supplements, and (84%) believed that supplements consumption improved their sports performance significantly, which was consistent with the present study. The Mean consumption of supplements by region can be seen in (Table 1). There are differences in the type of supplement consumed among the regions studied in Tehran. The mean consumption of supplements among participants by type of exercise can be seen in Fig. 1. Protein and carbohydrate, branched-chain amino acid (BCAA), fiber, anabolic steroids, glutamine, arginine, and antioxidant supplements were consumed more by bodybuilders. In general, most of the

supplements that cause muscle mass were consumed by bodybuilders and powerlifters. The highest consumption was for creatine and the lowest was for anabolic steroids. Arazi (23) conducted study on bodybuilders in Karaj and found that the consumption rate was (10.2%) for creatine, (41.4%) for Super Mass, (27.4%) for amino acids, (17.7%) for whey protein, and (2.8%) for various types of protein powders. The mean BMI was 27 for males and 26 for females and the mean percentage of water was 52 for males and 47 for females. The mean fat percentage was (27%) for males and (31%) for females and the mean bone mass was 13% for males and (11%) for females. The mean muscle mass was 34% for males and (31%) for females and the mean Waist-to-height ratio (WHtR) was 0.52 for males and 0.56% for females. In addition, the mean waist-to-hip ratio (WHR) was 0.92 for males and 0.99 for females (Table 2).

Table 1. Mean and standard deviation of supplement consumption among participants by region.

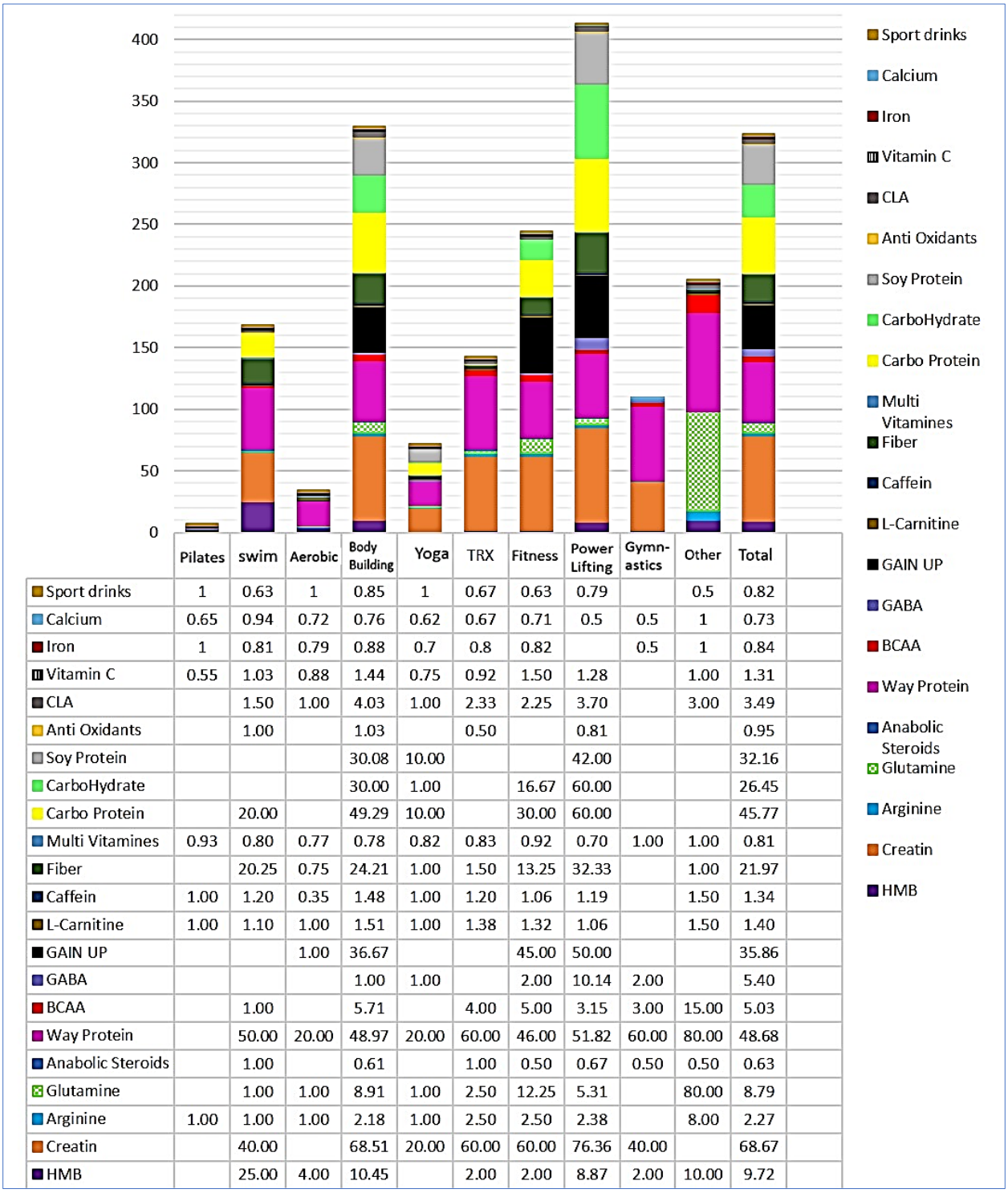
Supplement	North	West	South	East	Center	Total	P-value
	SD ± Mean	SD ± Mean	SD ± Mean	SD ± Mean	SD ± Mean	SD ± Mean	
Iron	0.85±0.31^{B*}	0.98±0.09^{B}	0.57±0.35^{A}	0.84±0.40^{B}	0.80±0.25^{B}	0.84±0.30	0.001
Calcium	0.64±0.32^{AB}	0.87±0.23^{C}	0.58±0.34^{A}	0.78±0.26^{ABC}	0.82±0.38^{BC}	0.73±0.32	0.022
Sports drinks	0.68±0.25	0.87±0.45	0.76±0.27	0.92±0.56	0.80±0.45	0.82±0.42	0.38
HMB	1.00±0.00^{A}	1.82±2.64^{A}	1.00±0.58^{A}	12.55±7.07^{B}	8.83±9.83^{B}	4.86±6.65	0.001<
Creatine	57.14±23.01^{A}	67.27±25.67^{AB}	80.77±26.82^{B}	60.50±28.00^{A}	71.25±30.08^{AB}	68.67±27.68	0.050
Arginine	2.67±0.82	1.87±1.03	1.87±1.03	2.10±1.51	2.86±2.41	2.27±1.37	0.42
Glutamine	25.00±33.17	22.22±45.58	11.36±5.05	85.50±190.73	90.50±133.28	43.93±103.67	0.22
Anabolic steroid	0.13±0.03	0.17±0.06	0.17±0.06	0.15±0.05	0.16±0.06	0.16±0.06	0.39
Whey Protein	48.22±26.43	42.31±24.55	54.44±22.55	42.00±22.10	57.00±37.13	48.68±25.98	0.46
BCAA	17.14±9.44^{A}	27.60±27.48^{AB}	27.75±16.52^{AB}	32.40±32.27^{AB}	45.00±25.34^{B}	30.21±24.42	0.19
GABA	1.31±0.38^{A}	1.88±0.53^{A}	0.75±0.00^{A}	1.13±0.43^{A}	22.50±10.61^{B}	4.05±8.02	0.001<
GAIN UP	50.00±0.00	20.33±19.50	0.00±0.00	45.00±7.07	0.00±0.00	35.86±18.71	
L-carnitine	1.01±0.49^{AB}	0.76±0.23^{A}	1.65±0.99^{C}	1.06±0.51^{AB}	1.22±0.38^{B}	1.05±0.55	0.001<
Caffeine	0.28±0.15	0.21±0.08	0.30±0.17	0.27±0.11	0.30±0.21	0.27±0.15	0.29
Fiber	15.58±16.2^{A}	20.73±17.49^{A}	38.75±6.41^{B}	19.67±15.36^{A}	22.40±19.96^{A}	21.97±16.80	0.03
Carboprotein	46.67±15.28	35.71±25.73	62.86±33.52	30.00±20.70	120.00±	45.77±31.26	0.018
Carbohydrate	30.00±0.00	60.00±0.00	20.00±0.00	23.50±22.30	20.00±0.00	26.45±19.50	0.57
Soy protein	45.00±17.32	26.83±26.38	20.00±0.00	21.67±9.83	60.00±28.28	32.16±22.18	0.16
Antioxidants	0.46±0.10	0.45±0.11	0.46±0.10	0.56±0.29	0.33±0.14	0.47±0.18	0.46
CLA	3.92±1.51^{AB}	3.55±1.92^{AB}	4.67±1.03^{A}	2.90±1.66^{B}	2.92±1.44^{B}	3.49±1.63	0.04
Vitamin C	0.44±0.21^{A}	0.56±0.46^{AB}	0.82±0.58^{B}	0.73±0.55^{AB}	0.70±0.45^{AB}	0.65±0.49	0.02

*According to ANOVA test, there was no significant difference between groups with similar notations using Duncan test.

Table 2. Mean and standard deviation of participants' anthropometric measurements by sex and region.

	North		West		South		East		Center	
Index	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Weight (kg)	87.17± 17.27^{AB}	67.62± 10.28	88.42± 16.37^{A}	65.96± 14.14	82.20± 14.65B	70.28± 13.77	84.15± 13.67^{AB}	70.27± 12.79	85.56± 10.20^{AB}	69.48± 11.21
Height (cm)	177.57± 9.02^{A}	162.02± 5.03	178.48± 6.95A	163.08± 6.32	173.28± 19.03C	163.75± 6.99	175.94± 6.94^{AC}	164.00± 5.48	177.18± 7.20^{AC}	162.45± 4.81
Hydration	52.27± 4.22	47.19± 5.98^{A}	52.46± 5.27	4.76± 8.03^{A}	52.48± 5.16	48.99± 6.25AB	51.69± 3.72	50.35± 6.47	52.32± 4.28	50.51± 6.47^{B}
Body fat	27.76± 9.47	32.13± 8.88	28.06± 9.17	31.20± 10.98	25.31± 8.93	31.21± 9.13	26.48± 6.20	29.01± 8.70	28.25± 7.38	29.06± 7.69
Bone mass	13.26± 1.34	11.41± 1.35^{A}	13.04± 1.32	11.29± 0.99^{AB}	13.07± 1.00	10.95± 1.43^{B}	12.98± 1.16	11.44± 1.23^{A}	12.93± 1.18	11.43± 1.21^{A}
Muscle mass	35.79± 6.55	31.68± 5.27	36.60± 6.39	31.76± 5.03	36.65± 6.58	32.25± 5.00	35.59± 4.69	32.85± 4.53	36.43± 4.32	32.91± 3.59
MUAC	35.80± 6.83^{A}	30.67± 4.32	34.62± 6.73^{AB}	30.95± 6.06	34.25± 6.29^{AB}	29.86± 5.32	33.54± 4.53^{B}	29.53± 4.52	33.25± 3.79^{B}	29.77± 4.14
Waist circumference	92.27± 14.51	102.28± 99.55	95.13± 14.60	87.95± 11.43	91.97± 12.45	89.02± 11.27	91.50± 8.89	89.57± 9.07	94.23± 8.06	91.26± 9.40
Waist	87.30± 14.26	83.99± 8.48	89.34± 14.44	84.66± 10.70	86.36± 11.52	82.48± 10.49	86.43± 8.12	84.66± 8.79	89.82± 7.24	86.05± 9.62
Hip	99.60± 10.56^{A}	101.92± 9.44	99.77± 9.31^{A}	102.69± 12.07	100.74± 10.81^{A}	102.04± 10.54	100.70± 8.62^{A}	99.36± 10.60	104.18± 7.11^{B}	102.32± 9.60
BMI	27.55± 4.89	25.83± 4.25	27.70± 4.69	24.85± 5.59	36.69± 82.50	26.33± 5.71	27.13± 3.73	26.15± 4.82	27.32± 3.59	26.44± 4.95
WHtR	0.52± 0.08	0.63± 0.62	0.53± 0.08	0.54± 0.08	0.56± 0.29	0.55± 0.08	0.52± 0.05	0.55± 0.06	0.53± 0.05	0.56± 0.07
WHR	0.92± 0.07^{A}	1.00± 0.97	0.95± 0.09^{B}	0.86± 0.08	0.91± 0.06^{A}	0.87± 0.06	0.91± 0.04^{A}	0.90± 0.04	0.90± 0.05^{A}	0.89± 0.04

^{ABC} According to ANOVA test, there was no significant difference between groups with similar notations using Duncan test.



	Pilates	swim	Aerobic	Body Building	Yoga	TRX	Fitness	Power Lifting	Gymn-astics	Other	Total
Sport drinks	1	0.63	1	0.85	1	0.67	0.63	0.79		0.5	0.82
Calcium	0.65	0.94	0.72	0.76	0.62	0.67	0.71	0.5	0.5	1	0.73
Iron	1	0.81	0.79	0.88	0.7	0.8	0.82		0.5	1	0.84
Vitamin C	0.55	1.03	0.88	1.44	0.75	0.92	1.50	1.28		1.00	1.31
CLA		1.50	1.00	4.03	1.00	2.33	2.25	3.70		3.00	3.49
Anti Oxidants		1.00		1.03		0.50		0.81			0.95
Soy Protein				30.08	10.00			42.00			32.16
CarboHydrate				30.00	1.00		16.67	60.00			26.45
Carbo Protein		20.00		49.29	10.00		30.00	60.00			45.77
Multi Vitamines	0.93	0.80	0.77	0.78	0.82	0.83	0.92	0.70	1.00	1.00	0.81
Fiber		20.25	0.75	24.21	1.00	1.50	13.25	32.33		1.00	21.97
Caffein	1.00	1.20	0.35	1.48	1.00	1.20	1.06	1.19		1.50	1.34
L-Carnitine	1.00	1.10	1.00	1.51	1.00	1.38	1.32	1.06		1.50	1.40
GAIN UP			1.00	36.67			45.00	50.00			35.86
GABA				1.00	1.00		2.00	10.14	2.00		5.40
BCAA		1.00		5.71		4.00	5.00	3.15	3.00	15.00	5.03
Way Protein		50.00	20.00	48.97	20.00	60.00	46.00	51.82	60.00	80.00	48.68
Anabolic Steroids		1.00		0.61		1.00	0.50	0.67	0.50	0.50	0.63
Glutamine		1.00	1.00	8.91	1.00	2.50	12.25	5.31		80.00	8.79
Arginine	1.00	1.00	1.00	2.18	1.00	2.50	2.50	2.38		8.00	2.27
Creatin		40.00		68.51	20.00	60.00	60.00	76.36	40.00		68.67
HMB		25.00	4.00	10.45		2.00	2.00	8.87	2.00	10.00	9.72

Fig. 1. Mean consumption of supplements among participants by the type of exercise.

In a study of 518 female handball players in Greece, Bayios et al. (24) reported a low body fat percentage for them. Pahlavani et al. (25) conducted a double-blind study of athletes. They found that athletes who took Al-Arginine supplement performed better than the placebo group, and had lower fat mass.

4. Conclusion

This study was conducted aimed at investigating the knowledge, attitude, and practice, as well as anthropometric measurements, dietary habits, physical activity, and socio-economic status of sports club's members. Given the high

prevalence of overweight among the members of sports clubs and their low level of physical activity and as the most common exercise in bodybuilding with the aim of fitness and weight loss and on the other hand, due to the low level of knowledge of individuals and receiving information by them from ignorant people such as trainers and social networks, it seems to make large-scale decisions to engage nutritionists in this area. Due to the insufficient knowledge and inappropriate attitude of the members of the sports clubs, it is recommended to take the necessary measures to raise the level of knowledge and improve the attitude of the individuals. Additionally, given the high mean BMI and high consumption of fat-burning supplements among women, measures to raise knowledge and training in clubs and the community are recommended. Since the level of physical activity was low in all groups, it seems necessary to raise the level of knowledge about the benefits of increasing physical activity and changing lifestyles in the workplace and leisure time. The dietary habits of individuals were moderate and poor in most regions. Therefore, establishing large-scale policies to raise the level of knowledge of people in the community is crucial. Correspondingly, implementing policies to monitor the market and prevent the entry and distribution of unauthorized and unlabeled supplements seems to be necessary, given the high consumption of protein and fat-burning supplements as well as the high consumption suggested by uninformed individuals and social networks.

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