



Original article

What are the beliefs and behaviours related to sport nutrition supplements, particularly regarding UAE regulatory issues, among male fitness centre members in Dubai?

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ABSTRACT

Objectives: The current study sought to investigate how sport nutrition supplements are used among a population of gym users in Dubai, United Arab Emirates (UAE), and the factors that underlie the consumption patterns of such supplements.

Methods: A descriptive, cross-sectional study was carried out in fitness centres in Dubai, UAE. Face-to-face, questionnaire-based interviews were then conducted; the structured questionnaire that was used was mainly composed of two sections: demographic and socio-economic information and beliefs and behaviours regarding sport nutrition supplements. The data were analysed using SPSS version 24.

Results: A total of 300 respondents participated in this study and completed the whole questionnaire. In this study, 40.3% (95% CI 34.7%–45.9%) of the respondents reported using sport nutrition supplements. The statistical modelling results showed that the belief that sport nutrition has positive effects on exercise performance, the belief that sport nutrition makes users healthier and smoking status were jointly highly associated with sport nutrition supplement behaviours.

Conclusion: The restriction of the availability of these sport supplements over the counter (OTC) is recommended, and health care providers and regulatory bodies are encouraged to contribute to efforts to provide counselling and raise awareness of the proper methods of use and the possible risks of such intake behaviour.

1. Introduction

The US Dietary Supplement Health and Education Act (1994) defines a dietary supplement as “a product (other than tobacco) intended to supplement the diet that bears or contains one or more of the following dietary ingredients”: a vitamin, mineral, herb or other botanical, amino acid, or certain other products intended to increase the nutritional value of the user's diet.^{1–3} The equivalent legislation in force in the Emirate of Dubai is Local Order No. 11 concerning the Public Health and Safety of Society (2003) and Administrative Resolution No. 30 (2007), in which the term “dietary supplements” is replaced with the term “health supplements”.

The last twenty years have seen a marked increase in the consumption of sport nutrition supplements in the US, largely due to a parallel increase in health awareness among the general population.^{4,5} The same trend has been identified in the Middle East, particularly among athletes,^{6–9} who consume a range of sport nutrition supplements for a variety of reasons. Ergogenic aids, including sports drinks, minerals, caffeine, coenzyme Q10, and creatine, are thought to improve performance and increase pain thresholds¹⁰ and are therefore among the most commonly taken sport nutrition supplements.

However, excessive consumption of such products can have a serious impact on health¹¹; indeed, their improper use can even cause death and disability.¹² Consequently, the protein, carbohydrates, and

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lipids contained within a given marketed product should not exceed the recommended range for such a product.¹³ The ingredients of sport nutrition supplements include substances with well-known nutritional value, including minerals and multivitamins; however, other substances for which the nutritional or medical value has not been substantiated, including certain herbs and other ingredients claimed to enhance sexual performance, are also commonly marketed as dietary or health supplements.¹⁴ Furthermore, surveys conducted with Saudi and other Middle Eastern athletes and students who consume sport nutrition supplements indicate that these individuals tend to believe the claims made for such supplements in terms of improvements in health, athletic achievement, and safety.^{6,9}

Their beliefs may be due to commonly held conceptions that minerals, vitamins, and herbal products are natural and safe, even if this is not always the case. Indeed, both long- and short-term effects have been caused by these types of products, with the former category including, *inter alia*, cardiovascular complications, gout, kidney stones, or even kidney failure, and the latter category including, *inter alia*, headaches, muscular cramps, and digestive problems.

The extent to which users of sport nutrition supplements are aware of the real nature of these products is debatable, and it remains unclear whether they consume them with due caution. The findings of studies conducted across several nationalities indicate that although such products are regularly consumed by a large proportion of gym users, this population is insufficiently informed of matters including indications, counterindications, dosages, and potential side effects. Many individuals seek no medical guidance before incorporating such supplements into their diets.^{15,16} Furthermore, the growth in sales of sport nutrition supplements indicates that such products are being consumed in ever greater volume, with the health consequences among both athletes and other users increasing.¹⁷

Some researchers have emphasized that the unnecessary or erratic use of sport nutrition supplements or the wrong choice of product can negatively impact performance, particularly when such use is due to misconceptions or a lack of knowledge.¹⁸ Nevertheless, manufacturers of sport nutrition supplements, whether in the Kingdom of Saudi Arabia, the United Arab Emirates (UAE) or the US, are obliged only to ensure that such products are safe, clean, and wholesome under the regulations imposed by the Saudi Food and Drug Authority (SFDA), Dubai Municipality, and US Food and Drug Administration (USFDA), respectively. In other words, no documentation, such as randomized clinical trial data, is required to prove the claims made for such products.^{19,20} Indeed, there have been many cases of sport nutrition supplements being recalled from sale because contamination with prescription drugs and/or microorganisms has been discovered.^{14,20–22}

Under Dubai Municipality regulations, sport nutrition supplements manufacturers must furnish proof that their products are manufactured in conditions that guarantee safety and purity and that samples of new products undergo examination in municipal laboratories. Despite these precautions, however, there have been cases in which health supplements contaminated with microorganisms have been approved and released for sale.²³ Similarly, in the US, certain products marketed under claims to enhance performance have been recalled because they were found to be contaminated by either prescription drugs designed to boost sexual performance (e.g., sildenafil) or amphetamine analogues.^{24,25} It is therefore clear that urgent regulatory action should be taken to prevent the mistaken or excessive use of sport nutrition supplements.

The current study sought to investigate how sport nutrition supplements are used among a population of gym users in Dubai, UAE, and the factors that underlie the consumption patterns of such supplements.

2. Methods and materials

2.1. Study design and setting

The aim of this descriptive, cross-sectional study was to investigate the beliefs and behaviours associated with the use of sport nutrition supplements. To this end, a number of fitness centres in the Emirate of Dubai, UAE, were surveyed by two trained final-year pharmacy students between October 2018 and July 2019.

2.2. Target population

The target population of this study was male members of fitness centres aged at least 18 years without speech or hearing difficulties. Due to the religious and cultural restrictions in the UAE, women were excluded from the study.

2.3. Data collection

The data were collected by the researchers in person at various fitness centres in Dubai using structured face-to-face questionnaire-based interviews. The study purpose was explained to each participant, and email contact details were recorded. The data collection period was 4th October 2018 to 27th July 2019.

2.4. Sample size calculation

Previous studies have reported significant variation in the use of sport nutrition supplements among male members of fitness centres, ranging from 13.3%,²⁶ to 44.5%,²⁷ to 46%²⁸ to 93.3%.²⁹ Therefore, we initially assumed a 20% prevalence of the use of sport nutrition among our target population. In addition, to achieve a CI of 95%, we set the α -level at 5% to ensure that the width of the interval would not exceed 10%. Therefore, based on the assumption of a 70% nonresponse rate, we estimated that a sample of 352 participants would be required.

2.5. Sampling technique

We used a stratified random sampling technique to ensure that the sample was representative; hence, the contact information for male fitness centres and gyms located in Dubai was drawn from local business directories. This information, which included the names, locations, email addresses, and phone numbers of the male fitness centres, was subsequently entered into an Excel spreadsheet for use as the sampling framework. The study sample was then constructed using simple random sample selection by randomly selecting male fitness centres based on their ID numbers, which were stratified based on their location.

2.5.1. Research instrument development

Four members of the research team who had experience developing and validating questionnaires developed the study questionnaire based on items used in previous questionnaires^{30–33} to investigate the beliefs and behaviours of male fitness centre members in relation to the use of sport nutrition supplements. The questionnaire was subsequently validated and examined for the relevance and appropriateness of its content by five medical and clinical pharmacy lecturers from Ajman University. Based on their feedback, the questionnaire was modified slightly. In addition, Lawshe's³⁴ content validity ratio (CVR) was used to assess the instrument's quantitative content validity, whereby only those items with a CVR score of 0.7 or above were considered acceptable; those items that did not meet the threshold were removed from the final instrument.³⁵ All except three of the items received a CVR score of 0.71. The content validity index (CVI), which was calculated based on the mean CVR score of all items that were retained in the final instrument, was 0.71, indicating that the entire instrument had acceptable content

validity.³⁶ In addition, a pilot study was conducted at three male fitness centres to test the instrument's face validity, and the pilot study participants were not included in the final analysis. Finally, the instrument's reliability was analysed by calculating its Cronbach's α value, which, at 0.76, demonstrated that the internal consistency of the instrument was acceptable.

2.5.2. Research instrument sections

The interview questionnaire contained 12 questions focusing on participants' sociodemographic data (e.g., age and education level); exercise frequency; average daily exercise time; chronic health conditions; smoking status; and beliefs about sport nutrition supplements, including the effect on health and exercise and potential side effects. The participants' answers were recorded as “yes”, “no” or “don't know”.

2.5.3. Ethical considerations

The researchers sought and received approval from the Institutional Ethical Review Committee of Ajman University P-F-H-2020-01-23). The researchers used the letter of approval during the distribution and collection of the questionnaires. The study purpose was explained to all participants prior to the interview. The participants were also informed that their participation was completely voluntary, that they would not receive any compensation for participating and that the questionnaire would be completed and submitted only with their full consent. All participants signed the form stating that they gave their full and informed consent.

2.5.4. Statistical analysis

The data were analysed using SPSS version 24. Qualitative variables were summarized using the frequency (percentage) as appropriate, while quantitative variables were summarized using the mean \pm standard deviation (\pm SD). Logistic and linear regression models were used to examine the factors associated with sport nutrition use. Chi square and Fisher's exact tests were used to investigate the association between beliefs and behaviours related to the use of sport nutrition supplements. Simple and multiple logistic regression models were used to study the factors associated with the use of sport nutrition. A p value < 0.05 was chosen as the criterion for statistical significance.

2.6. Sociodemographic characteristics of the study participants

A total of 300 respondents participated in this study and completed the entire questionnaire. The majority of the respondents were aged between 18 and 40 years, had no chronic health conditions, and had a relatively high level of education (e.g., an associate degree or above). Moreover, three-quarters of the participants (76%) were non-smokers. According to the data on the **frequency of exercise per week**, 18.3% exercised 1–2 days weekly, 54.3% exercised 3–5 days per week and 27.3% exercised 6–7 days per week (Table 1).

Table 1
Frequency table for demographic and socio-economic characteristics (n = 300).

Demographic characteristics	Response	Frequency	Percentage
Age group	18–25	212	70.7%
	26–40	72	24.0%
	More than 40	16	5.3%
Educational level	High school.	63	21.0%
	Baccalaureate degree	218	72.7%
	Post graduate	19	6.3%
Smoking	Yes	71	23.7%
	No	229	76.3%
Suffer from any chronic diseases	Yes	40	13.3%
	No	260	86.7%
Frequency of exercise weekly	1–2 days per week	55	18.3%
	3–5 days per week.	163	54.3%
	6–7 days per week.	82	27.3%

Table 2

Logistic regression analysis for factors affects the use of sport nutrition supplements.

Independent variables	Use of sport nutrition supplements weekly			
	OR	95% CI	P.value	
Age group (Ref. more than 40)				
18–25	4.398	1.416	13.663	0.010
26–40	2.662	0.828	8.559	0.100
Educational level (Ref. Post graduate)				
High school.	1.364	0.418	4.450	0.607
Baccalaureate degree	1.460	0.553	3.850	0.445
Smoking (Ref. No)				
Yes	1.384	0.768	2.497	0.280
Chronic diseases (Ref. Yes)				
No	1.505	0.726	3.121	0.272
Frequency of exercise weekly (Ref. 1–2 days per week)				
3–5 days per week.	2.896	1.421	5.900	0.003
6–7 days per week.	2.752	1.212	6.248	0.016

Abbreviations, OR, odd ratio; $p < 0.05$ Significance; 95% CI confidence interval.

2.7. Prevalence of sport nutrition supplement use and associated factors

In this study, 40.3% (95% CI 34.7%–45.9%) of the respondents reported using sport nutrition supplements. Participants aged between 18 and 25 years were more likely to use sport nutrition supplements than participants aged 40 years or older (OR 4.39; 95% CI 1.4–13.6; $P = 0.010$).

Participants who exercised 3–5 days per week were more likely to use sport nutrition supplements than participants who exercised 1–2 days per week (OR 2.8; 95% CI 1.4–5.9; $P = 0.003$). Similarly, participants who exercised 6–7 days per week were more likely to use sport nutrition supplements than participants who exercised 1–2 days per week (OR 2.7; 95% CI 1.2–6.2; $P = 0.016$) (Table 2).

2.8. Association between respondents' beliefs and behaviours related to the use of sport nutrition supplements

Table 3 presents the association between participants' beliefs and behaviours related to the use of sport nutrition supplements. Sport nutrition supplement non-users were more likely than users to believe that sport nutrition have side effects (62.5% vs. 37.5%; $P < 0.0001$). On the other hand, more sport nutrition supplement users believed that sport nutrition supplements have positive effects on exercise performance (54% vs. 46%; $P < 0.0001$), make users healthier (67.2% vs. 32.8%; $P < 0.0001$), improve their stamina (56.2% vs. 43.8%; $P < 0.0001$), help them cope with or overcome physical pain (55.7% vs. 44.3%; $P < 0.0001$) and improve their ability to concentrate (57.1% vs 42.9%; $P < 0.0001$) (Table 3).

To determine the set of factors that jointly influenced behaviours related to the use of sport nutrition supplements, we used a stepwise procedure applied to the multivariate logistic regression model. The results of this procedure showed that the belief that sport nutrition has positive effects on exercise performance, the belief that sport nutrition makes users healthier, and smoking status were jointly highly associated with sport nutrition supplement behaviours (Table 4).

3. Discussion

It has been reported in the literature that both genders are interested in body image and that male individuals are especially concerned about their muscular image due to their association of muscularity with masculinity; thus, men usually tend to focus their gym goals on shaping their muscular form.³⁷ In the process of achieving their muscle-related gym goals, men use several methods, including the use of sport supplements, which can have a serious impact on health if not used

Table 3
The association between respondents' perception and consumption of sport nutrition supplements.

	Groups	Sport nutrition supplements users		P-value
		No	Yes	
Sport nutrition supplements have side effects	Yes	62.5%	37.5%	< 0.001
	No	39.1%	60.9%	
	Don't know	70.2%	29.8%	
Sport nutrition have positive effects on exercise performance	Yes	46%	54%	< 0.001
	No	84.2%	15.8%	
	Don't know	82.2%	17.8%	
Sport nutrition supplements make you healthier	Yes	32.8%	67.2%	< 0.001
	No	74.2%	25.8%	
	Don't know	78.9%	21.1%	
Sport nutrition improve your stamina	Yes	43.8%	56.2%	< 0.001
	No	58.3%	41.7%	
	Don't know	81.6%	18.4%	
Sport nutrition supplements boost your energy	Yes	50%	50%	< 0.001
	No	54.5%	45.5%	
	Don't know	82.1%	17.9%	
Sport nutrition help you cope with or overcome physical pain	Yes	44.3%	55.7%	< 0.001
	No	52.9%	47.1%	
	Don't know	74.8%	25.2%	
Sport nutrition improve your ability to concentrate	Yes	42.9%	57.1%	< 0.001
	No	54.3%	45.7%	
	Don't know	76.9%	23.1%	

properly.^{37,38} Our current study included a total of 300 male participants, the majority of whom were non-smokers and had no chronic diseases. Most of the participants (79%) had a university bachelor's degree or above (Table 1). It was observed that 40.3% of the respondents reported the use of sport nutritional supplements and that younger participants aged between 18 and 25 were more likely to use sport nutritional supplements than participants aged 40 years and older (OR 4.39; 95% CI 1.4–13.6; P = 0.010) (Table 2). The frequency of exercise was correlated with the use of sport nutritional supplements, and the results showed that participants who exercised 3–5 days per week were more likely to use sport nutritional supplements than participants who exercised 1–2 days per week (OR 2.8; 95% CI 1.4–5.9; P = 0.003); a similar correlation was observed for participants who exercised 6–7 days per week (OR 2.7; 95% CI 1.2–6.2; P = 0.016) (Table 2). The results showed that supplement non-users were more likely than users to believe that supplements have side effects (62.5% vs. 37.5%; P < 0.0001) and that supplement users believed that sport nutritional supplements have positive effects on exercise performance, improve users' health status, improve their stamina, help them cope with or overcome physical pain and improve their ability to concentrate (P < 0.0001) (Table 3).

To choose the set of factors that jointly influenced behaviours related to the use of sport nutritional supplements, a stepwise procedure was applied to the multivariate logistic regression model, and the results showed that the belief that sport nutritional supplements have positive effects on exercise performance, the belief that sport

nutritional supplements improve health status, and smoking status were jointly highly associated with sport nutritional supplement behaviours. In terms of participants' beliefs regarding the importance of supplements, our current study found that 67.2% of supplement users believed that supplements are essential for health; these results were in accordance with the results of a recent cross-sectional study conducted in the UAE in 2019 targeting college students that showed a similar result of 68.3%.³⁹ Regarding respondents' perceptions of sport nutritional supplement consumption side effects, a recent systematic review of 2019 stated that although some users indicated a general lack of knowledge of the potentially harmful effects of these drugs, others were aware of the side effects; this finding has been observed in several studies, including ours. In our study, the results revealed that the majority of sport nutritional supplement users (60.9%) believed that sport nutritional supplements have no side effects and can be safely used, which is in contrast to a recent study in the UAE that reported a percentage of 39.8%.³⁹ This difference can be explained by the involvement of college students of both genders in the recent study held in UAE, which included a limited age group of 18–24 years only, and the number of male individuals in their study was smaller (male: 205, female: 247) than that in our study, which targeted mainly male gym attendants who were from a wider age group. This gender variability might have affected and directed the participants' responses and choices and ultimately affected the final outcome. It was also observed in our study that the majority of sport nutrition supplement users (54%) believed that sport nutrition supplements have positive effects on exercise performance, but the percentage was lower than that in a study conducted in Saudi Arabia in 2017 that revealed that most of the participants (79.1%) believed that supplements helped enhance performance.⁴⁰ This could be attributed to the possible increased awareness of the availability of other safer alternatives to boost performance among individuals in our study, as most of the participants in our study had a university level or higher education, while in the study in Saudi Arabia, the educational level of participants was not assessed.

The majority of participants in the Saudi study who used supplements (85.6%) did not believe that using these agents would cause harm; the observed percentage was similar but slightly lower in our study results, which showed that the majority of sport nutritional supplement users (60.9%) believed that sport nutritional supplements do not have side effects.⁴⁰ Similarly, a previous study in the UAE as well as a study in Kuwait reported that the participants did not believe in the side effects of the supplements taken.^{41,42} Regarding the reported reasons for using supplements, the main reason stated by sport supplement users in our study was to be healthier (67.2%), followed by to improve the ability to concentrate, improve stamina, overcome physical pain, improve exercise performance and boost energy (57.1%, 56.2%, 55.7%, 54% and 50%, respectively). A study conducted in Egypt revealed that 83.4% of respondents stated positive effects on performance to be the reason for sport supplement use, which is higher than in our results (54%). Overcoming physical pain was reported as a reason by 55.7% of respondents in our study, which is lower than the rate reported in Egypt (66.3%). On the other hand, similar results were observed between the two studies, as 57.1% of respondents in our study stated that supplements improved the ability to concentrate compared to 59.4% in the Egyptian study.⁴³

Regarding the prevalence of sport nutrition supplement use and associated factors, the results on the frequency of exercise per week

Table 4
Multivariate logistic regression analysis for the factors associated the use of sport nutrition supplements.

Variables	B	O.R	95% C.I.	P-Value	
Sport nutrition have positive effects on exercise performance	1.199	3.318	1.777	6.193	< 0.001
Sport nutrition supplements make you healthier	1.516	4.554	2.603	7.968	< 0.001
Smoking	0.771	2.161	1.155	4.044	0.016

showed that 18.3% exercised 1–2 days weekly, 54.3% exercised 3–5 days per week and 27.3% exercised 6–7 days per week, and our study findings indicated that participants who exercised 3–5 days per week were more likely to use sport nutrition supplements than participants exercised 1–2 days per week (OR 2.8; 95% CI 1.4–5.9; $P = 0.003$), which was in accordance with the results of a study held in Germany in which 60.8% of supplement users trained 3–4 times a week compared to 50% who exercised 1–2 times a week (< 0.0001).⁴⁴ Our study showed that the majority of participants who visited the male gym were between 18 and 25 years old, which indicates that this age group is crucial, and it is highly recommended to raise awareness among young individuals regarding the risks associated with using supplements to achieve gym goals through social media as well as educational programmes starting at the high school level. Educational programmes should not be limited only to gym users but rather should include parents and gym trainers, who can greatly influence individuals' decisions by suggesting safer alternatives. It is also recommended to restrict the availability of these sport supplements over the counter (OTC) and encourage health care providers and especially pharmacists to contribute to efforts to provide counselling and raise awareness of the proper methods of use and the possible risks of such intake behaviour. Several limitations to the current study should be acknowledged and addressed, such as the limited sample size of participants and the inclusion of only one male sport gym in the sample, which limited the generalizability; in addition, the participants' responses could have been subject to bias, as a self-report survey was used.

4. Conclusion

Further large-scale longitudinal studies should be conducted to address this serious issue and develop practical solutions to overcome and prevent any future complications.

Declaration of competing interest

The author(s) declare(s) that there is no conflict of interest regarding the research, authorship, and/or publication of this paper.

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