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Study on the motives and reasons for using dietary supplements among female bachelor Saudi students of King Saud University

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Abstract

Introduction: Supplements are quite common and have an enviable position in the world. There has been considerable use of dietary supplements (DS) among many groups, including women, the elderly, health professionals, gymnasts, pregnant women, and children under 18 years of age and university students. The aim of this project was to study the motives and reasons for using DS among female bachelor Saudi students of King Saud University. Data was collected by self-questionnaire. The study was conducted on 400 randomly selected female bachelor students (126 from scientific colleges, 74 from health colleges and 200 from humanitarian colleges) at King Saud University. It has been observed that 186 (46.5%) have used dietary supplements while 214 (53.5%) participants have never used it at all. Vitamin D was the most frequently used supplement followed by multivitamins, iron, omega 3 and others. Doctors were the main influencer and complementing the diet (28.5%) followed by hair and nails issues (26%), improvement in the physical performance (18.5%) and treatment or cure of a specific disease or health problem (16.3%) were the main reasons behind its use. Conclusion: Female students use DS for beauty enhancement, supplementing their diet and for improvement in their physical performance. In addition, vitamin D and multivitamins were the most commonly used DS. Moreover, the use of DS was related to health colleges, academic year, physical activity and reading of food label. There is a need for intensive and better education about dietary supplements.

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Introduction

Food and Drug Administration (FDA) defined dietary supplement (DS) as “a product intended for ingestion that contains a dietary ingredient intended to add further nutritional value to (supplement) the diet” (USFDA, 2022). It includes minerals, vitamins, herbs and various other products that improve nutrient levels. Among the common reasons people consume; nutritional supplements is to increase energy, improve physical performance, and correct a variety of deficiencies related to lifestyle (stress, colds, heart attacks, osteoporosis, cancer, tooth decay, and neural tube defects in infants) (Dwyer, 2013; Read *et al.*, 1989). Numerous countries are turning to dietary supplements, with a steady increase in their use (Lieberman *et al.*, 2015). There has been considerable use of dietary supplements among many groups, including women, the elderly, health professionals, gymnasts, pregnant women, and children under 18 years of age and university students, especially health science students. The high prevalence of DS may indicate a healthier lifestyle, as it plays a key role in maintaining good health as a diet delivers essential nutrients while supplements complements diet as it allows consumption of any deficiencies the diet lacks (Sirico *et al.*, 2018). The developing world has been plagued with malnutrition due to lack of micronutrients, so supplementation has proven beneficial to those dealing with these deficiencies.

Supplements are quite common and have an enviable position in American society. Half of US adults (Kennedy *et al.*, 2013) and approximately 30% of children and adolescents take DS (Picciano *et al.*, 2007) and other developed countries have reported the average rate of multivitamin supplementation usage as 20% to 30% or even higher (El-Kadiki and Sutton, 2005). But there is no accord on its efficiency and safety, and inconsistent studies appear frequently in peer-reviewed scientific journals (Lobb, 2009; Haller *et al.*, 2008). The Kingdom of Saudi Arabia is a rapid growing economic country and Saudis have been putting an increasing focus on maintaining their health and protecting themselves from disease in recent years. Saudi DS market is expected to reach USD 366.94 million by 2026, growing at CAGR of

8.04% until 2026 (Consumer Goods and Retail, 2021). DS provides good amount of micro nutrients to the diet which is very important for health. Studies have shown incidences of neural tube defect due to deficiency of dietary folate among pregnant women (Seidahmed *et al.*, 2014) and prevalence of anemia in the Kingdom (Alquaiz *et al.*, 2015). However, excessive consumption can have adverse effects on the body too, for example, high doses of vitamin D can result in osteoporosis and muscle wasting (Owens *et al.*, 2017; Marcus, 2016). There is no requirement for manufacturers of herbal supplements to provide the FDA with proof of their safety and efficacy (USFDA, 2008), which allows industries in creating these multivitamins to grow rapidly around the world (Bruins *et al.*, 2018). Supplements also tend to contain active ingredients that can have strong effects on the body and cause adverse reactions, especially if taken in the place of prescription medicines or when taken with several other types of supplements at the same time (NIH, 2001). Studies have shown that up to 12-58% of supplements on the market contained potentially harmful ingredient not mentioned on their label, such as hormones, prohormones, beta2-agonists, stimulants, and anabolic steroids (Martinez-Sanz, *et al.*, 2017; Geyer *et al.*, 2008; Baume *et al.*, 2006). Various adverse effects associated with DS consumption include risks of contamination, improper product dosage, interactions between supplements and drugs, allergic reactions, cardiovascular complications, gastrointestinal distress, anxiety, fever, and nausea (Valentine *et al.*, 2018; Geller *et al.*, 2015).

Bailey *et al.* (2013) in their study reported that the most of the participants use DS for good health and the percentage of female using DS were reported to be higher than males (Bailey *et al.*, 2013). Sirico *et al.* (2018) reported that almost 41.7% participants uses DS to increase their athletic performance, 26.6% to improve health, and 8.7% to improve mental abilities, in addition to gaining or losing weight (Sirico *et al.*, 2018). Similarly, many studies are available in the Middle East, including Saudi Arabia which studied the prevalence of dietary supplements among the population and revealed the reasons for using them.

Albakri *et al.* (2017) reported that the most prominent reasons were the impact of the media on buying them for skin care and beauty (40.37%), health care prescription (37.34%), good health (14.13%). The aim of this project was to study the motives and reasons for using DS among female bachelor Saudi students of King Saud University.

Materials and methods

Participants

This cross-sectional study was conducted among Saudi female bachelor students at King Saud University, Riyadh, Saudi Arabia. The sample consisted of 400 participants. Students were randomly selected from Scientific College (126), from Health College (74) and from Humanitarian College (200). An informed consent was signed by each participant before filling the questionnaire.

Inclusion and exclusion criteria

The participants must be Saudis and aged from 18 years old and above.

Instrument

A total of 30 samples of non-main sample were collected to determine the applicability of the questionnaire and the supplement use questionnaire was tested for content validity and reliability in the target population. It consisted of multiple-choice response options.

The questionnaire was composed of three sections. First part contained the information related to age, marital status, and level of education, college, family income and presence of any chronic disease and their physical activity. In the second part of the questionnaire, the participants' were enquired about the use dietary supplements. They were asked whether they consumed any DS in the past one month or one year. They were also asked to identify the types of DS they used along with the volume and frequency of its usage. In addition they were also asked the questions related to the sources of DS related information, reasons and their belief for its use. In the third part of the questionnaire they were asked whether they read food labels for DS or not.

Ethics approval

The study was ethically approved by the Institutional Review Board (IRB) of King Saud University, Riyadh, Saudi Arabia (KSU-HE-19-78).

Statistical analysis

The Cronbach's α factor, which measures the reliability factor in the questionnaire, was used and the estimate was 72.3%. Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS), version 24 and statistical significance was determined at $p \leq 0.05$.

Descriptive statistics and frequencies have been used in the study to describe the sample characteristics based on age, income, marital status, BMI and other demographic aspects. Chi square (χ^2) tests of independence have been used to examine association between DS consumption and demographic data and between DS consumption and reading food label for dietary supplements products, and physical activity.

Results

Socio-demographic characteristics of the participants

Table 1 depicts the demographic characteristics of the participants. Most (56.3%) of the participants of the study were less than 20 years old and 41% were from the age group of 21-23 years. The BMI of almost 61% of the participants were normal while almost 14% were underweight and 26% were either overweight or obese. It has been observed that 97.0% of the participants were single and incomes of 23.8% participants were more than 27,000 Saudi riyals while 3.8% had incomes less than 3,000 Saudi riyals.

Maximum (52.0%) participants were from Humanity colleges, followed by Science (31.5%) and Medical (18.5%) colleges. It has been found that 86.5% of the participants were not suffering from any disease while three of them had diabetes (0.8%). Some of them were suffering from blood pressure (1%), heart disease (0.3%), kidney disease (0.3%), anemia (2.8%), asthma (1.3%), sensitivity (1.5%), and only 0.3% had kidney stones, thyroid or skin cracking issue. Maximum (97.5%) participants were nonsmoker.

Table 1. Sociodemographic characteristics of the participants.

Variables	F (%)
Age	
Less than 20 Years	225(56.3)
From 21 to 23 Years	164(41.0)
More than 23 Years	11(2.9)
Total	400(100)
BMI	
Under weight	55(13.8)
Normal	242(60.5)
Over weight	62(15.5)
Obese	41(10.3)
Total	400(100)
Marital status	
Married	12(3)
Single	388(97)
Total	400(100)
Family income	
Less than 3000	15(3.8)
3000 ≤9000	46(11.5)
9000 ≤15000	85(21.3)
15000 ≤21000	92(23.0)
21000 ≤27000	67(16.8)
>27000	95(23.8)
Total	400(100)
Colleges	
Science Colleges	126(31.5)
Medical Colleges	74(18.5)
Humanities Colleges	200(52.0)
Total	400(100)
Academic Year	
First year	61(15.3)
Second year	108(27.0)
Third year	109(27.3)
Fourth year	96(24.0)
Fifth year	21(5.3)
Sixth Year	5(1.3)
Total	400(100)
Presence of chronic disease	
I have no disease	346(86.5)
Diabetes	3(0.8)
Obesity	20(5.0)
Blood pressure	4(1.0)
Heart disease	1(0.3)
Kidney disease	1(0.3)
Anemia	11(2.8)
Asthma	5(1.3)
Sensitivity	6(1.5)
Kidney stones	1(0.3)
Thyroid gland	1(0.3)
Skin cracking	1(0.3)
Total	400(100)
Are you a smoker	
No	390(97.5)
Yes	10(2.5)
Total	400(100)

F- Frequency; %- percentage

Physical activity of the participants

Table 2 depicts that only 24.5% participants reported that they follow an exercise program. Only 23%

participants reported that they exercise vigorously for 20 minutes at least three times a week while 38.3% perform vigorous exercise sometimes while 38.8% never do any vigorous exercise. Almost 48% responded positively for light to moderate physical activity such as walking 30-40 minutes for 5 or more times a week. Most (68.8%) of the participants do their exercise during usual daily activity such as walking during lunch, using stairs instead of elevator, parking car away from destination and walking and only 14.8% do stretching exercises at least 3 times/ week while 58% of them never do any kind of stretching exercises.

Table 2. Physical activity of the participants.

Physical activity	Never F (%)	Sometimes F (%)	Always F (%)
Follow planned exercise program	138 (34.5)	164 (41)	98 (24.5)
Exercise vigorously for 20 minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using stair climber)	155 (38.8)	153 (38.3)	92 (23)
Take part in light to moderate physical activity such as (sustain walking, 30-40 minutes for 5 or more times a week)	66 (16.5)	141 (35.3)	193 (48.30)
Take part in leisure time physical activity such as (swimming, dancing, bicycling)	98 (24.5)	172 (43)	130 (32.5)
Get exercise during usual daily activity such as walking during lunch, using stairs instead of elevator, parking car away from destination and walking	30 (7.5)	95 (23.8)	25.5 (68.8)
Do stretching exercises at least 3 times/ week	232 (58)	109 (27.3)	59 (14.8)

F- Frequency; %- percentage

Use of dietary supplements and reasons for using dietary supplements

Table 3 shows the use of dietary supplements and reasons for using dietary supplements. It has been observed that 186 (46.5%) have used dietary supplements while 214 (53.5%) participants have never used DS at all. Among those who have used the dietary supplements, 165 (41.3%) students have stated that they used them last year, and 88 (22%) students have used them in the past 30 days.

Table 3. Use of dietary supplements and reasons for using dietary supplements.

Dietary Supplements	F (%)
Use of dietary supplements	
Do you take any dietary supplement?	
Yes	186(46.5)
No	214(53.5)
Taken in the past 30 days?	
Yes	88(22.0)
No	312(78.0)
Taken in the past year?	
Yes	165(41.3)
No	235(58.8)
Reasons for using dietary supplements	
To complement the diet	114(28.5)
For hair and nails	104(26.0)
To improve physical performance	74(18.5)
To treat or cure a specific disease or health problem	65(16.3)
For anemia	60(15.0)
For healthy skin	57(14.2)
To improve mental ability or memory	47(11.8)
For bone health	36(9.0)
To improve sleep	31(7.8)
To improve sports performance	30(7.5)
To prevent a specific disease or health problem	28(7.0)
To improve immune system	23(5.8)
For heart health and cholesterol reduction	15(3.8)
To gain weight	12(3.0)
For weight loss	9(2.3)
For healthy teeth	8(2.0)
For pregnancy	3(0.8)
Anti-aging	3(0.8)
Allergy	3(0.8)
For convulsions	2(0.5)
Who is influencing your use of dietary supplements?	
Medical doctor	110(27.5)
Self-administration	70(17.50)
Parents	63(15.8)
Internet and Social Communication	36(9.1)
Friends	16(4.0)
Pharmacist	13(3.3)
Coach	1(0.3)
If you have never used any dietary supplement please, why did you don't take them?	
Don't need it	88(22.0)
Never thought about it	82(20.5)
No reason	68(17.0)
It is not safe to use	26(6.5)
Never heard of it (don't know much about it)	26(6.5)
It costs too much	8(2.0)
A health care provider told me not to use it	9(2.3)
Medical science has not shown that it works	5(1.3)

F- Frequency; %- percentage

Complementing the diet (28.5%) followed by hair and nails issues (26%), improvement in the physical

performance (18.5%) and treatment or cure of a specific disease or health problem (16.3%) were the main reasons behind its use. Doctors (27.5%) followed by self-administration (17.50%), parents (15.8%), internet and social communication (9.1%) was the main influencer behind DS use. Only 22% participants believes that DS are irrelevant and there is no need of its use while 6.5% of them even believe that it is unsafe.

Type and frequency of dietary supplements consumption

Table 4 shows the frequency of DS consumption. Data indicates that Vitamin D was the most frequently used supplement followed by multivitamins, iron, omega 3, vitamin B₁₂, calcium, zinc, biotin, folic acid, vitamin C, multimineral and others. It has been found that most of the students use to consume DS once a day.

Table 4. Type and frequency of dietary supplements consumption.

Supplements	One Pill per day (%)	Two Pills per day (%)	One Pill per week (%)	From 2 to 4 Pills per week (%)	Total F (%)
Vitamin D	42(10.5)	6(1.5)	41(10.3)	9(2.3)	98(24.5)
Multivitamins	65(16.3)	14(3.5)	4(1.0)	2(0.5)	85(21.3)
Iron	50(12.5)	9(2.3)	2(0.5)	3(0.8)	64(16.0)
Omega3	36(9.0)	5(1.3)	5(1.3)	1(0.3)	47(11.8)
Vitamin B ₁₂	20(5.0)	4(1.0)	7(1.8)	-	31(7.8)
Calcium	19(4.8)	3(0.8)	3(0.8)	-	25(6.3)
Zinc	19(4.8)	3(0.8)	-	-	22(5.5)
Biotin	15(3.8)	4(1.0)	-	-	19(4.8)
Folic acid	14(3.5)	2(0.5)	-	1(0.3)	17(4.3)
Vitamin C	11(2.8)	-	1(0.3)	1(0.3)	13(3.3)
Multimineral	6(1.5)	-	-	-	6(1.5)
Vitamin B ₆	5(1.3)	1(0.3)	-	-	6(1.5)
magnesium	2(0.5)	-	2(0.5)	1(0.3)	5(1.3)
Vitamin E	4(1.0)	-	-	-	4(1.0)
Vitamin A	1(0.3)	1(0.3)	1(0.3)	-	3(0.8)
Potassium	2(0.5)	-	-	-	2(0.5)
Protein	1(0.3)	-	1(0.3)	-	2(0.5)
Vitamin K	1(0.3)	-	-	-	1(0.3)
Phosphorus	1(0.3)	-	-	-	1(0.3)
Flax seed oil	1(0.3)	-	-	-	1(0.3)

F- Frequency; %- percentage

Reading food labels of dietary supplements

Habit of reading food labels has been depicted in table 5. More than one-third of the participants (N=154; 38.5%) read the food label of DS products. It has been found that only 32.8% of the students understand the contents of the food sign for dietary supplement products and 25.5% believes that the food label of dietary supplement products affects purchasing choices only sometimes while 34.8% believes that it always affect the purchasing choice.

Table 5. Reading food labels of dietary supplements.

Reading food labels	No F (%)	Sometimes F (%)	Yes F (%)
I read the food label for dietary supplements products	118(29.5)	128(32)	154(38.5)
I understand the contents of the food label for dietary supplements products	145(36.3)	124(31)	131(32.8)
The food label of dietary supplement products affects my purchasing choices	159(39.8)	102(25.5)	139(34.8)

F- Frequency; %- percentage

Relationship between supplement consumption and demographic data and reading food label for dietary supplements products, and physical activity

Table 6 and 7 shows the relationship between the use of the supplements and the demographic data, physical activity and reading food label. Statistically significant relationship between the use of dietary

supplements and BMI ($p= 0.04$) has been noted. Similarly its use was significantly associated with family income ($p = 0.03$), colleges, ($p=0.00$) and the academic year ($p= 0.02$). Almost 60% of overweight students were found to consuming DS.

Medical college students of the last year with higher income group were mostly involved in DS consumption. In contrast age, social status, sleeping hours, smoking GPA and presence of any disease was not associated with the use of dietary supplements. Table 7 clearly depicts that a strong relationship between the use of DS and reading the food label, understanding it and its impact on the purchase of the supplements ($p=0.00$). Similarly, following planned exercise program ($p=0.04$), exercising vigorously for 20 minutes at least three times a week ($p=0.04$) and stretching exercises at least 3 times/week ($p=0.04$) was also strongly associated with DS consumption.

Table 6. Results of Chi square test for relationship between supplement consumption and demographic data.

Demographic data	Do you take any dietary supplement?			Chi-Square Value	P-Value
	No F (%)	Yes F (%)	Total F (%)		
Age					
Less than 20 Years	127(56.4)	98(43.6)	225(100.0)	1.90	0.39
From 21 to 23 Years	81(49.4)	83(50.6)	164(100.0)		
More than 23 Years	6(54.5)	5(45.5)	11(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
BMI					
Under weight	25(45.5)	30(54.5)	55(100.0)	8.19*	0.04
Normal	139(57.4)	103(42.6)	242(100.0)		
Overweight	25(40.3)	37(59.7)	62(100.0)		
Obese	25(61.0)	16(39.0)	41(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Social status					
Married	4(33.3)	8(66.7)	12(100.0)	2.02	0.16
Single	210(54.1)	178(45.9)	388(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Family income in (SR)					
Less than 3000	10(66.7)	5(33.3)	15(100.0)	12.26*	0.03
3000 ≤9000	24(52.2)	22(47.8)	46(100.0)		
9000 ≤15000	51(60.0)	34(40.0)	85(100.0)		
15000 ≤21000	58(63.0)	34(37.0)	92(100.0)		
21000 ≤27000	31(46.3)	36(53.7)	67(100.0)		
>27000	40(42.1)	55(57.9)	95(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Sleeping hours					
5 hours or Less than	50(54.3)	42(45.7)	92(100.0)	5.58	0.13
6-8 hours	115(50.0)	(50.0)	230(100.0)		
10-12 hours	38(59.4)	26(40.6)	64(100.0)		
More than 12 hours	11(78.6)	3(21.4)	14(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		

Demographic data	Do you take any dietary supplement?			Chi-Square Value	P-Value
	No F (%)	Yes F (%)	Total F (%)		
Are you a smoker?					
No	209(53.6)	181(46.4)	390(100.0)	0.05	0.82
Yes	5(50.0)	5(50.0)	10(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Colleges					
Science colleges	72(57.1)	54(42.9)	126(100.0)	10.57**	0.00
Medical colleges	27(36.5)	47(63.5)	74(100.0)		
Humanities Colleges	115(57.5)	85(42.5)	200(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
(GPA) Grade Point Average					
Acceptable	1(33.3)	2(66.7)	3(100.0)	1.90	0.59
Good	17(48.6)	18(51.4)	35(100.0)		
Very Good	103(51.8)	96(48.2)	199(100.0)		
Excellent	93(57.1)	70(42.9)	163(100.0)	13.74*	0.02
Total	214(53.5)	186(46.5)	400(100.0)		
Academic year					
First year	40(65.6)	21(34.4)	61(100.0)	13.74*	0.02
Second year	52(48.1)	56(51.9)	108(100.0)		
Third year	57(52.3)	52(47.7)	109(100.0)		
Fourth year	57(59.4)	39(40.6)	96(100.0)	18.17	0.70
Fifth year	5(23.8)	16(76.2)	21(100.0)		
Sixth Year	3(60.0)	2(40.0)	5(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Do you suffer from any of these diseases?					
I have no disease	188(54.3)	158(45.7)	346(100.0)	18.17	0.70
Diabetes diseases	1(33.3)	2(66.7)	3(100.0)		
Obesity	11(55.0)	9(45.0)	20(100.0)		
blood pressure	1(25.0)	3(75.0)	4(100.0)		
Heart disease	0(0.0)	1(100.0)	1(100.0)		
Kidney disease	1(100.0)	0(0.0)	1(100.0)		
Anemia	5(45.5)	6(54.5)	11(100.0)		
Asthma	2(40.0)	3(60.0)	5(100.0)		
Sensitivity	4(66.7)	2(33.3)	6(100.0)		
Kidney stones	0(0.0)	1(100.0)	1(100.0)		
thyroid gland	1(100.0)	0(0.0)	1(100.0)		
Skin cracking	0(0.0)	1(100.0)	1(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		

(**) There is a statistically significant relationship at (0.01) or less; (*) There is a statistically significant relationship at (0.05) or less; F- Frequency; %- percentage

Table 7. Results of Chi-Square test for relationship between do you take any dietary supplement and Reading food label for dietary supplements products, and physical activity.

Reading food labels for dietary supplement products	Dietary Supplement			Chi-Square Value	P-Value
	No F (%)	Yes F (%)	Total F (%)		
I read the food label for dietary supplements products					
No	89(75.4)	29(24.6)	118(100.0)	38.39**	0.00
Sometimes	67(52.3)	61(47.7)	128(100.0)		
Yes	58(37.7)	96(62.3)	154(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
I understand the contents of the food label for dietary supplements products					
No	105(72.4)	40(27.6)	145(100.0)	43.37**	0.00
Sometimes	66(53.2)	58(46.8)	124(100.0)		
Yes	43(32.8)	88(67.2)	131(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
The food label of dietary supplement products affects my purchasing choices					
No	113(71.1)	46(28.9)	159(100.0)	33.09**	0.00
Sometimes	45(44.1)	57(55.9)	102(100.0)		
Yes	56(40.3)	83(59.7)	139(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		

Reading food labels for dietary supplement products	Dietary Supplement			Chi-Square Value	P-Value
	No F (%)	Yes F (%)	Total F (%)		
Physical activity					
Follow plan exercise program					
Never	74(53.6)	64(46.4)	138(100.0)	5.75*	0.04
Sometimes	97(59.1)	67(40.9)	164(100.0)		
Always	43(43.9)	55(56.1)	98(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Exercise vigorously for 20 minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using stair climber)					
Never	88(56.8)	67(43.2)	155(100.0)	5.88*	0.04
Sometimes	85(55.6)	68(44.4)	153(100.0)		
Always	41(44.6)	51(55.4)	92(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Take part in light to moderate physical activity such as (sustain walking,30-40minutes for 5 or more times a week)					
Never	36(54.5)	30(45.5)	66(100.0)	0.77	0.68
Sometimes	79(56.0)	62(44.0)	141(100.0)		
Always	99(51.3)	94(48.7)	193(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Take part in leisure time physical activity such as (swimming, dancing, bicycling)					
Never	45(45.9)	53(54.1)	98(100.0)	3.41	0.18
Sometimes	99(57.6)	73(42.4)	172(100.0)		
Always	70(53.8)	60(46.2)	130(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Get exercise during usual daily activity such as walking during lunch, using stairs instead of elevator, parking car away from destination and walking					
Never	18(60.0)	12(40.0)	30(100.0)	0.56	0.76
Sometimes	50(52.6)	45(47.4)	95(100.0)		
Always	146(53.1)	129(46.9)	275(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		
Do stretching exercises at least 3 times/ week					
Never	132(56.9)	100(43.1)	232(100.0)	4.98*	0.04
Sometimes	58(53.2)	51(46.8)	109(100.0)		
Always	24(40.7)	35(59.3)	59(100.0)		
Total	214(53.5)	186(46.5)	400(100.0)		

(**) There is a statistically significant relationship at (0.01) or less; (*) There is a statistically significant relationship at (0.05) or less; F; Frequency,%; Percentage

Table 8. Beliefs related to dietary supplements.

Beliefs	F (%)
Are dietary supplement necessary for all age?	
Agree	126(31.5)
Disagree	162(40.5)
I do not know	112(28.0)
Total	400(100.0)
Dietary supplement are generally harmless	
Agree	149(37.3)
Disagree	137(34.3)
I do not know	114(28.5)
Total	400(100.0)
Regular use of dietary supplement prevent chronic diseases	
Agree	91(22.8)
Disagree	124(31.0)
I do not know	185(46.3)
Total	400(100.0)
Is it possible to get all your food needs through food?	
Agree	249(62.3)
Disagree	108(27.0)
I do not know	43(10.8)

Beliefs	F (%)
Total	400(100.0)
Do you recommend using dietary supplements?	
Yes	285 (71.3)
No	115(28.7)
Total	400(100.0)

Beliefs related to dietary supplements

Table 8 depict the participants believe related to DS. Only 126 (31.5%) participants believed that DS is necessary for all ages and 37.3% participants believe that they are generally harmless. Ninety one (22.8%) participants believed that regular use of dietary supplement prevent chronic diseases while 124(31.0%) participants disagreed at this point. Although 249(62.3%) participants believe that it is possible to get all food needs through food but then also 285 (71.3%) recommend its consumption.

Discussion

Various studies have shown that the usage of the dietary supplements is wide spread. The present study is explicitly studying the causes and motives of using the dietary supplements. It has been found that the prevalence of DS use by female students of King Saud University was 46.5% which is quite in line with the results reported by Al-Johani *et al.* (2018), in which 44% of the medical college students in the eastern province of the Kingdom used DS. Slight variation might be due to the reason that Al-Johani *et al.* (2018) included only one college in their study while the current study included three different colleges. Some available studies from United states reported a supplementation rate between 53.6% and 80.00% (Begdache *et al.*, 2020; Valentine *et al.*, 2018; Lieberman *et al.*, 2015), 63.2% in Saudi Arabia (Algaeed *et al.*, 2019), 62% in Rajasthan, India (Saini *et al.*, 2019); 84.8% in Karachi, Pakistan (Qidwai *et al.*, 2012). Studies conducted at the national level indicate that approximately 50% of adults (Dickinson *et al.*, 2014, Kennedy *et al.*, 2013) and approximately 32% of children (Picciano *et al.*, 2007) regularly use DS. Over one million volunteers, aged over 40, were studied longitudinally for 20 years and it was found that DS usage dramatically increased over that period (Kim *et al.*, 2014).

It has been observed that around one-third (28.5%) of the participants mentioned that complementing the diet was the major reason behind DS consumption followed by aesthetic requirements. The aesthetic elements were nails and hair (26%), skin health (15%) and anti-aging (0.8%). The study group in this study was females and it is quite obvious that females pay more attention to health and beauty. Another important reason mentioned by the participants behind DS consumption was physical performance improvement (18.5%), the treatment of a particular disease or health problem (16.3%), and anemia (15.0%). The modern technologies and sedentary lifestyle plays a crucial role in restricting movements which in turn causes various health problems. Accordingly, finding a substitute for compensating these problems is the tendency to use DS. These percentages may vary in other studies, but are often consistent with the reasons behind DS consumption.

A study by Kobayashi *et al.* (2017) in Japan, explained that the students' use of supplements was first to complete a diet (95%), then for beauty (36.7%), and in a small percentage for curing health problems (3.7%). Similarly, Braun and Venter (2008) also reported that supplementing the diet and preventing diseases were the main reason behind DS consumption. Pillay and Pillay (2019) reported that improved energy level, overall physical health and better memory and concentration were the effects reported from DS consumption. But Lieberman *et al.*, (2015) have mentioned that majority of DS used by college students do not enhance these functions or have not been sufficiently tested to determine whether they are effective.

After identifying the reasons behind DS consumption, the types of the DS used were searched, and it was found that Vitamin D was the most used DS followed by multiple vitamins, iron and others. This result is in consistent with the results of the study conducted in In the Eastern Province of Saudi Arabia by Al-Johani *et al.* (2018) where vitamin D was the highest in consumption (50.3%) followed by multivitamins (41.3%) and iron (36%) respectively. ALTamimi (2019) and Kobayahi *et al.* (2017) and Braun and Venter (2008) also reported that most of the participants consumed vitamins as the major DS. There are concerns about the overuse of DS by college students, since many college habits seem to persist into adulthood. There is an apparent trend among students to take DS to resolve a problem they may not have (Lieberman *et al.*, 2015)

It has been observed that 53.5% did not use any DS. The reasons behind not using any DS were; do not need, did not think about it, no reason, not safe, did not hear about them, and expensive. This outcome is in consistent with the responses observed in the study by Axon *et al.* (2017) in pharmacy students. ALTamimi (2019) in her study reported that 44.9% participants believes that DS are sometime safe while Alfawaz *et al.* (2017) in their study has reported that 36.7% participants were unaware about the side effects of DS. Pillay and Pillay (2019) in their study on use of DS among dietetics students reported that "unnecessary/waste of money, undesirable side effects or

consequences and unsure about DS” as their main reasons for not using DS. DS consumption has been linked to an increased risk of morbidity and mortality in epidemiologic and clinical trials (Bjelakovic *et al.*, 2007; Mursu *et al.*, 2011). A major problem with dietary supplements and their ingredients is that most college students are unaware of their properties, which can result in not only positive results but also adverse effects like gastrointestinal, neurological, and drug interactions (Teschke *et al.*, 2012; Sadovsky *et al.*, 2008; Wallace *et al.*, 2008).

The results of the study revealed that 27.5% of the sample uses doctor’s recommendation for DS use, followed by personal decision, parents, internet and social media and others. Similar results has been reported earlier by Sirico, *et al.* (2018), who mentioned that the doctor, personal decision, parents, internet, friends and the trainers influenced the participants decision of DS consumption. In another study on students of Dammam, Saudi Arabia, the students mentioned that they typically obtained prescriptions for supplements from doctors (Naqvi *et al.*, 2018).

Regarding the question of reading the DS food label, understanding it, purchasing it, and its influence on the use of dietary supplements, a statistically significant relationship has been found in the present study ($p = 0.00$). It indicates that the interest of individuals in nutrition has led to their interest in the culture of reading the food label. It helps the consumers to make the right decision. Al-Khamees (2018) in his study in Kuwait showed that the 32.8% students read the food label before their first purchase.

Concerning the outcomes of the meta-data and their relationship to the use of DS the age was not associated with the use of dietary supplements ($P = 0.39$). It might be due to the reason that; the female students who used DS were nearly at the same age. The outcomes of Shahwan and Al Abdin, (2018) were consistent with the outcomes of present study that the age was not statistically significant with the use of dietary supplements among the medical students at Ajman University ($P = 0.084$).

In a study in Japan by Kobayashi *et al.* (2017), 22.0% of health college students were the most common users of DS. Another study conducted in Italy by Sirico *et al.* (2018), revealed that the students of health professional universities (44.8%) were the most common users. These outcomes are in consistent with the outcomes of the current study, where it was found that the percentage of the students in the health colleges was using DS was high when compared with other steams and this confirms there is a relationship of statistical significance between the use of dietary supplements and the colleges. This is due to the fact that the health college students study the dietary supplements in some way.

A study by Bailey *et al.* (2013) in America revealed that overweight (57%) people uses DS more as compared to others which is in line with the outcome of present study (59.7%). It may be due to the reason that overweight and obese peoples tries to obtain the ideal weight by following a diet and uses DS to compensate the deficiency which may happen due to reduced food consumption.

The study also found a relationship between the use of supplements and family income, academic year, physical activity and food label. A positive association (57.9%, $P=0.03$) has been observed between the household income and DS consumption, i.e. higher the incomes higher will DS consumption. The reason is that the family income gives an opportunity to purchase DS at any price. Fattahzadeh-Ardalani *et al.* (2016) also reported that DS use among students was statistically linked with social status while another study in Saudi Arabia reported insignificant association between consumption of supplements and social status (Al-Johani *et al.*, 2018).

For the academic year, the percentage of the female students in the fifth year was 76.2% ($P=0.02$) which was the highest. Pillay and Pillay (2019) and Van der Kreuk *et al.* (2013) reported that fourth year students consumed more DS as compared to first year student. This indicates a relationship between the DS use and the higher level of education. The more a person learns, understands and becomes aware, the more he

uses the supplements. It could also be that with experience, senior students may have realized the importance of dietary supplements in enhancing academic performance and enhancing overall health and nutrition.

For the physical activity factor, there was a statistically significant correlation between the people who exercise and DS consumption ($p=0.04$). In the current study, from the researcher's point of view, the sportive users believe that dietary supplements have a role in improving athletic performance. These outcomes are in line with the report of Al-Johani *et al.* (2018) of medical students in the eastern province, in which the DS use was associated with the high family income, the academic year and the exercise.

Concerning the believes related to DS, the outcomes of the present study showed that 162 participants disagreed and 126 agreed that DS are necessary for all ages. Apart from that, 149 participants agreed that DS are generally harmless. The outcomes of a study in Italy on 770 people by Sirico, *et al.* (2018), showed that the more participants did not agree that supplements are necessary for all ages, which is consistent with the current study. More than 50% of the participants agreed that the individual can fulfill their nutritional need through food which indicates the awareness of the participants related to nutrition.

Study Limitations and Recommendations

This study was conducted on different colleges of a single University, which does not allow for generalized conclusion on students in general. It is recommended to apply the research topic (motives and reasons for the use of dietary supplements) with another variable such as gender. It is also recommended to have further studies on dietary supplements and to assess the students' supplements education in different universities and schools.

Conclusion

Food supplements are often used excessively and unconsciously by the majority of people in modern society as a result of the trends, time constraints, social media, and advertising in recent years. Female

students use DS for beauty enhancement, supplementing their diet and for improvement in their physical performance. In addition, vitamin D and multivitamins were the most commonly used DS. Moreover, the use of DS was related to health colleges, academic year, physical activity and reading of food label. There is a need for intensive and better education about dietary supplements.

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