

## Original Research Article

# Knowledge, awareness and practices regarding dietary supplements in Jordan

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### Abstract

**Purpose:** To investigate the knowledge, attitudes and beliefs pertaining to dietary supplements (DS) use in Jordan.

**Methods:** Participants were enrolled from four main cities in Jordan, viz, Amman, Zarqa, Irbid, and Mafraq, to fill a self-administered questionnaire which explored the objectives of the study.

**Results:** Most participants (80 %) knew what DS are. The prevalence of DS use was high (62.1 %) and significantly higher among females ( $p = 0.004$ ). The most commonly consumed DS among users were in the form of multivitamins (93.0 %), vitamin D (65.8 %) and vitamin C (57.6 %). About half of the participants (46.2 %) believed that DS have no side effects. The most frequent source of information for participants about DS was from non-reliable references, such as social media. Self-prescription was the most common approach by DS users for supplement intake. Finally, the common hypothesis of associating healthy habits with DS use was not found to be true among Jordanians.

**Conclusion:** These results highlight the need to implement appropriate awareness programs for the public regarding DS benefits and hazards, and especially to advise the public not to initiate DS use without first consulting an appropriate healthcare professional.

**Keywords:** Dietary supplements, Vitamins, Self-prescription

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## INTRODUCTION

The use of DS to treat health conditions is well established, with the use of vitamin C to treat scurvy disease and vitamin D in preventing and treating rickets as primary examples [1].

In addition, the role of DS in non-communicable diseases including cancer and cardiovascular complications has shown to be conflicting. It has

been reported by many studies that DS can reduce the risk of developing the aforementioned health issues [1]. In contrast, some researchers have presented that the unnecessary use of DS showed neither positive nor negative outcomes, likewise, others have observed overwhelming side effects. In the Park *et al* study, an association between the use of multivitamins and the increase or decrease of cancer or cardiovascular deaths could not be found during

the eleven years follow up study with 182,099 participants [2].

In recent years, there has been a substantial increase in the use of DS worldwide due to media advertising supplements as health products free of any potential risks. Accordingly, many studies have been conducted in different countries including Italy, Korea, and USA, to assess the population's knowledge about DS and to assure that they are used safely and effectively [3-5]. In Jordan, to our best knowledge, there is only one study that has examined the attitudes of DS users. However, it was only conducted among university students at University of Jordan; in which 27.4 % of participants reported the use of DS mostly in the form of multivitamins [6].

Furthermore, there is an increasing evidence of an association between healthy habits such as regular physical activity, avoiding smoking products and maintaining healthy body weight with DS intake [7].

Limited evidence is available regarding the user's knowledge and attitudes among the Jordanian population, in respect to DS consumption in different demographic backgrounds. This study aims to investigate the awareness and knowledge about DS among the Jordanian population as well as their habits and beliefs regarding the use of supplements. The findings of the current study shed light on knowledge about DS use, factors influencing DS use, and the attitudes and characteristics of the typical user in Jordan.

## METHODS

### Study design

A cross sectional study was conducted in four main cities in Jordan including; Amman, Zarqa, Irbid, and Mafraq. Participants above 18 years old were randomly recruited during weekdays from individuals attending universities and workplaces over a period of six weeks from Nov 2019, on a voluntary basis. The minimum required sample size (385) was calculated at (95 %) confidence level and (5 %) margin of error with (50 %) response [8]. The same research assistant handed all the self-administered questionnaires and a script containing information about the questionnaire and privacy rights was read to all participants beforehand. Persons who had no interest in the survey refused to participate and only the persons who agreed to the terms of participation were included. The informed written consent forms

were obtained from all participants and all questionnaires were filled anonymously. The study protocol was conducted in accordance to the good clinical practices and principles as stated in the Declaration of Helsinki document [9]. The study was approved by the ethical committee review board at Zarqa University in Jordan (no: 3/1/2019-2020).

### Study tools

The questionnaire was adapted after comprehensive literature search based on other relevant published questionnaires [3,10]. It was developed into closed/open ended questions and reviewed internally at the faculty of pharmacy at Zarqa University. Then, a pilot study of 60 participants was carried out to evaluate the clarity of the survey items as well as the analysis of preliminary data before performing the full launch. Data obtained during the internal piloting study was included in the main study analysis. The survey was designed in Arabic language and consisted of three main sections; the first section aimed to collect demographic characteristics; which included nationality, gender, age, educational level and discipline, social status, occupation, weight, height, smoking status and physical activity (frequency and intensity). The second part aimed to assess the participant's knowledge and awareness about DS. Participants were explicitly asked about the knowledge indicated by being able to give one example of DS, source of information, beliefs in term of benefits and risks regarding DS use. If the participants assumed a beneficial role of DS in the course of any disease, they were requested to indicate if DS have a role in terms of treatment and/or prevention of diseases and to specify the supplement involved in this role. Finally, the participants were asked in the third section to answer questions regarding their use of DS, reasons for intake, most consumed DS, prescription method, as well as their attitudes toward use of DS including adherence. Participants were allowed to choose more than one answer when appropriate. Participants were considered non-users of DS if they indicated that they had never used DS until the time of study.

### Data analysis

Data were coded and inputted into IBM Statistical Package for Social Sciences (SPSS®) Statistics for Windows, Version 22, (IBM Corp., Armonk, N.Y., USA), for statistical analysis. Descriptive statistics with corresponding 95 % confidence intervals were constructed. Differences between various groups were evaluated using Pearson chi-Square correlation test  $\chi^2$  and Fisher exact

tests for categorical variables.  $P < 0.05$  were considered statistically significant. To measure the association between variables, the Cramer's V coefficient test was used. Results of Cramer's V coefficient test was interpreted as  $> 0.25 =$  very strong,  $> 0.15 =$  Strong,  $> 0.10 =$  moderate,  $> 0.05 =$  weak and  $> 0 =$  no or very weak following "User's guide to correlation coefficients" by Akoglu [11].

## RESULTS

### Study sample and demographic characteristics

Questionnaires were handed out to the public to participate in the survey entitled "Knowledge, awareness and practices about dietary supplements in Jordan". The final sample size was 509 participants. The participants were included in the study if they completed the questionnaire and gave written informed consent for participation.

The majority of participants were female (52.7 %), in the age group 18 – 25 years (45.0 %), Jordanian (91.8 %), non-smokers (66 %), with abnormal weight as indicated by BMI (57.6 %) and physically inactive (54.6 %). In addition, most of the participants were bachelor degree holders (63.3 %) and have no association with the medical field (65.4 %) (Table 1 and 2).

**Table 1:** Demographic characteristics of the study population

Demographics	Sample size N = 509 (%)
<b>Age</b>	
18 – 25 years.	N = 229 (45.0)
26 – 30 years.	N = 109 (21.4)
31 – 40 years.	N = 105 (20.6)
>40years.	N = 66 (13.0)
<b>Gender</b>	
Male	N = 241 (47.3)
Female	N = 268 (52.7)
<b>Marital status</b>	
Single	N = 283 (55.6)
Married	N = 226 (44.4)
<b>Having Children</b>	
Yes	N = 207 (40.7)
No	N = 302 (59.3)
<b>Nationality</b>	
Jordanian	N = 467 (91.8)
Others	N = 42 (8.2)
<b>Education level</b>	
High school or less.	N = 137 (26.9)
Bachelor.	N = 322 (63.3)
Post graduate university degree (e.g., MSc., PhD)	N = 50 (9.8)

**Table 2:** Demographic characteristics of the study

Demographics	Study population N = 509 (%)
<b>Occupation</b>	
Student	N = 175 (34.4)
Housewife	N = 68 (13.4)
Medical services	N = 82 (16.1)
Private occupation	N = 179 (35.2)
Others	N = 5 (1.0)
<b>Medical field association (students or workers)</b>	
Yes (Medicine, pharmacy, nursing and others)	N = 176 (34.6)
No	N = 333 (65.4)
<b>BMI</b>	
Underweight (BMI < 18.5 kg/m <sup>2</sup> )	N = 18 (3.5)
Normal weight (BMI: 18.5 – 24.9 kg/m <sup>2</sup> )	N = 216 (42.4)
Overweight (BMI: 25 – 29.9 kg/m <sup>2</sup> )	N = 185 (36.3)
Obese (BMI > 30.0 kg/m <sup>2</sup> )	N = 90 (17.7)
<b>Smoking</b>	
Yes	N = 173 (34.0)
No	N = 336 (66.0)
<b>Physical activity</b>	
No	N = 278 (54.6)
Yes	N = 231 (45.4)
<b>Frequency of exercise</b>	
1	N = 26 (5.1)
2	N = 67 (13.2)
3	N = 67 (13.2)
4	N = 32 (6.3)
≥ 5	N = 35 (6.8)
<b>Duration of exercise sessions</b>	
30-45 minutes	N = 143 (28.0)
60-90 minutes	N = 77 (15.1)
More than 90 minutes	N = 11 (2.2)

### Knowledge and awareness about DS

Table 3 shows results in regard to knowledge and awareness about DS, most participants (80 %) knew what DS are and most of the information was obtained from the internet and social media web pages (45 %). A significant difference was observed between genders (Table 4).

Females had more knowledge about DS ( $p = 0.003$ ) compared to males. Furthermore, the knowledge about DS was significantly higher among the medical field participants ( $p = 0.016$ ) (Table 4).

Regarding possible side effects of DS, 46.8 % of participants believed that DS have side effects (Table 3), and this was strongly associated with medical field specialty (Cramer's V = 0.184) ( $p = 0.005$ ) (Table 4). Furthermore, participants who were physically active strongly believed that DS have side effects (Cramer's V = 0.184) ( $p = 0.001$ , Table 4). In respect to the role of DS in disease prevention or treatment, the majority of

participants answered that DS use could neither prevent (64.6 %) nor treat (73.3 %) chronic diseases (Table 3).

**Table 3:** Knowledge and awareness about DS among participants

<b>Do you know what DS are?</b>	N=509, (%)
Yes	N = 407 (80.0)
No	N = 102 (20.0)
<b>What is your source of information regarding DS?*</b>	N=407, (%)
None	N = 139 (34.2)
Physicians	N =99(14)
Pharmacists	N = 57 (8.8)
Social media and internet	N = 183 (45)
Family members	N = 51 (12.5)
Sport Trainers	N = 29 (7.1)
<b>Do you think that DS have side effects?</b>	N=509, (%)
Yes	N = 238 (46.8)
No	N = 235 (46.2)
I don't know	N = 36 (7.1)
<b>Do you think that DS can prevent chronic diseases?</b>	N=509, (%)
Yes	N = 152 (29.9)
No	N = 329 (64.6)
I don't know	N = 28 (5.5)
<b>Do you think that DS can treat chronic diseases?</b>	N=509, (%)
Yes	N = 109 (21.4)
No	N = 373 (73.3)
I don't know	N = 27 (5.3)

This was found to be statistically significant, mainly among participants who are related to the medical field (Cramer's V = 0.178, 0.131) ( $p \leq 0.005$ , 0.013), respectively for prevention and treatment (Table 3).

Concerning gender difference, there was a strong association between gender and belief of DS role in disease course. Females believed significantly more in the role of DS in disease prevention and treatment (Cramer's V = 0.157, 0.158) ( $p = 0.002$ , 0.002), respectively (Table 4). Unexpectedly, most of the participants, even the ones who agreed that DS could prevent or treat diseases, were not sure about which diseases are treatable or preventable (Table 5).

#### Attitudes, habits and use of dietary supplements

Most of the survey participants (62.1 %) have used DS, with the majority of DS users being females ( $p = 0.004$ ) and from the age group 31-40 years ( $p = 0.025$ ). Furthermore, the belief about DS benefits was statistically significant among females ( $p = 0.013$ ), medical field participants ( $p = 0.001$ ) (Table 6).

In respect of association of DS intake and healthy habits, no association was found between DS use and BMI (Cramer's V = 0.072), physical activity (Cramer's V = 0.025), and smoking status (Cramer's V = 0.012) (Table 7).

The most commonly used DS by participants were in the form of multivitamins (93.0 %) followed by vitamin D (65.8 %) and vitamin C (57.6 %) (Table 8). Of note, a very strong association was only found between the intake of body building supplements, such as proteins and creatine, with gender (Cramer's V = 0.286), and physical activity (Cramer's V = 0.252) ( $p \leq 0.005$ ).

Furthermore, smoking status (Cramer's V = 0.223) and young age 18 - 25 years (Cramer's V = 0.226) were also strongly associated with body building supplements intake (Table 9). Other demographic data showed low or no association with body building supplements intake.

The study's results showed a very significant association between knowledge and use (Cramer's V = 0.408) ( $p \leq 0.005$ ) (Table 10). Users believed more significantly than non-users that DS have no side effects, having a positive role in disease prevention or treatment. This observation was found statistically significant (Cramer's V > 0.2) ( $p \leq 0.005$ ).

Regarding DS indications, the DS users mostly took DS to overcome a deficiency (51 %) and/or to improve their health and well-being (44 %). DS was mainly self-prescribed by the users (92.1 %) or prescribed by physicians (53.2 %). The majority of users (71.8 %) were adherent to the recommended daily dose as indicated by the label or health care professionals.

## DISCUSSION

Limited evidence is available regarding DS use among Jordanian population. One study was published by Suleiman et al about the vitamin-mineral use in Jordan, however, it was only conducted on university students and from the age group 17 - 28 years old at university of Jordan [6]. To the best of our knowledge this study is the first to investigate the knowledge, awareness, beliefs and attitudes about use of DS by the Jordanian public. The results showed that the majority of participants (80 %) knew what DS are. This was significantly high among the medical field participants. This agrees with many studies that compare medical and non-medical participants' knowledge about DS [12].

**Table 4:** Knowledge and beliefs about DS among gender, medical field and physical activity groups

Variable	Gender			medical field affiliation			Physical activity		
	male	female	total	Yes	No	total	active	inactive	total
<b><u>Do you know what DS are?</u></b>									
Yes, N	179	228**	407	152*	255	407	187	220	407
Column %	<b>74.3</b>	<b>85.1</b>	<b>80</b>	<b>86.9</b>	<b>76.6</b>	<b>80</b>	<b>82.4</b>	<b>78</b>	<b>80</b>
No, N	62	40	102	23	79	102	40	62	102
Column %	<b>25.7</b>	<b>14.9</b>	<b>20</b>	<b>13.1</b>	<b>23.7</b>	<b>20</b>	<b>17.6</b>	<b>22</b>	<b>20</b>
Total	241	268	509	175	333	509	227	282	509
<b><u>Do you think DS have adverse effects?</u></b>									
Yes, N	116	122	238	102**	137	239	129**	109	238
Column %	<b>48.1</b>	<b>45.5</b>	<b>46.8</b>	<b>58.3</b>	<b>41</b>	<b>47</b>	<b>56.8</b>	<b>38.7</b>	<b>46.8</b>
No, N	106	129	235	68	166	235	85	150	235
Column %	<b>44</b>	<b>48.1</b>	<b>46.2</b>	<b>39.0</b>	<b>49.7</b>	<b>46.2</b>	<b>37.4</b>	<b>53.2</b>	<b>46.2</b>
I don't know, N	19	17	36	5	30	35	13	23	36
Column %	<b>7.9</b>	<b>6.3</b>	<b>7.1</b>	<b>2.9</b>	<b>9</b>	<b>6.9</b>	<b>5.7</b>	<b>8.2</b>	<b>7.1</b>
Total	241	268	509	175	334	509	227	282	509
<b><u>Do you think DS can prevent diseases?</u></b>									
Yes, N	59	93**	151	65**	87	151	69	83	151
Column %	24.5	34.7	29.7	36.9	26.1	29.7	30.4	29.4	29.7
No, N	162	168	329	110	220	329	147	183	329
Column %	67.2	62.7	64.6	62.5	66.2	64.6	64.8	64.9	64.6
I don't know, N	20	7	29	1	26	29	11	16	29
Column %	8.3	2.6	5.7	0.6	7.8	5.7	4.8	5.7	5.7
Total	241	268	509	176	333	509	227	282	509
<b><u>Do you think DS can treat diseases?</u></b>									
Yes, N	43	66**	109	45*	64	109	51	58	109
Column %	<b>17.8</b>	<b>24.6</b>	<b>21.4</b>	<b>25.6</b>	<b>19.2</b>	<b>21.4</b>	<b>22.5</b>	<b>20.6</b>	<b>21.4</b>
No, N	177	196	373	128	245	373	164	209	373
Column %	<b>73.4</b>	<b>73.1</b>	<b>73.3</b>	<b>72.7</b>	<b>73.6</b>	<b>73.3</b>	<b>72.2</b>	<b>74.1</b>	<b>73.3</b>
I don't know, N	21	6	27	3	24	27	12	15	27
Column %	<b>8.7</b>	<b>2.2</b>	<b>5.3</b>	<b>1.7</b>	<b>7.2</b>	<b>5.3</b>	<b>5.3</b>	<b>5.3</b>	<b>5.3</b>
Total	241	268	509	176	333	509	227	282	509

\*\*P value ≤ 0.005, \*P value ≤ 0.05. DS = Dietary Supplements

**Table 5:** Beliefs of participants regarding the role of DS in diseases or clinical complications

Disease or clinical complications	Prevention N (%)	Treatment N (%)	Prevention and treatment N (%)	I don't Know N (%)	Examples on DS given by participants
Pregnancy Complications	68 (13.4)	12 (2.4)	52 (10.2)	377 (74.1)	Iron, B complex, Folic acid, Calcium, Omega 3
Osteoporosis	61 (12.0)	18 (3.5)	65 (12.8)	365 (71.7)	Calcium, Vitamin D
Osteoarthritis	63 (12.4)	17 (3.3)	49 (9.6)	379 (74.5)	Calcium, Vitamin D, Glucosamine, B complex
Cancer	68 (13.4)	9 (1.8)	39 (7.7)	393 (77.2)	Vitamin D, B complex, Ginger, Garlic, Vitamin C&E, Omega 3
Cardiovascular Diseases	67 (13.2)	18 (3.5)	45 (8.8)	378 (74.3)	B complex, Ginger, Vitamin E, Cod liver oil, Zinc, Omega 3
Immunity	61 (12.0)	10 (2.0)	60 (11.8)	378 (74.3)	B complex, Vitamin C&E, Omega 3
Influenza	50 (9.8)	17 (3.3)	67 (13.2)	375 (73.7)	Vitamin C, Ginger, Zinc
Cataract (disambiguation)	54 (10.6)	19 (3.7)	33 (6.5)	403 (79.2)	B complex, Vitamin A, Vitamin D, Zinc
Kidney disease	56 (11.0)	9 (1.8)	40 (7.9)	404 (79.4)	Calcium, Vitamin D
Diabetes mellitus	61 (12.0)	14 (2.8)	42 (8.3)	492 (77.0)	B complex, Garlic, Vitamin D, Fish oil

**Table 6:** Use and beliefs about DS among participants according to gender, age and medical affiliation

Variable	Gender			Age (years)				Medical field affiliation			
	Male	Female	Total	18-25	26-30	31-40	>40	Total	Yes	No	Total
<b>Have you used DS?</b>											
Yes, N	134	182**	316	130	67 (21.2)	78*(24.7)	41	316	117	199	316
Column %	55.6	68.0	62.1	57.3	61.5	74.3	60.3	62.1	66.5	59.8	62.1
No, N	107	86	193	99 (50.3)	42 (21.8)	27	25	193	59	134	193
Column %	44.4	32.1	37.9	43.2	38.5	25.7	37.7	37.9	33.5	40.2	37.9
Total	241	268	509	229 (45)	109 (21.4)	105 (21)	66	509	176	333	509
<b>Do you believe that DS have benefits?</b>											
Yes, N	175	215*	390	167	84	88	51	390	150**	240	390
Column %	72.6	80.2	76.6	72.9	77.1	88.3	77.3	76.6	85.2	72.1	76.6
No, N	48	47	95	51	18	13	13	95	24	71	95
Column %	19.9	17.5	18.6	22.3	16.5	12.4	19.7	18.7	13.6	21.3	18.7
I don't know, N	18	6	24	11 (45.8)	7 (29.2)	4	2	24	2	22	24
Column %	7.5	2.2	4.7	4.8	6.4	3.8	2.9	4.7	1.1	6.6	4.8.7
Total	241	268	509	229	109	105	66(13)	509	176	333	509

\*\*P value ≤ 0.005, \*P value ≤ 0.05. DS = Dietary Supplements

**Table 7:** Association between DS use and indicators of healthy habits

Variable	BMI				Total	Physical activity			Smoking		
	< 18.5	18.5 - 24.9	25 - 30	> 30		Active	Inactive	Total	Yes	No	Total
<b>Have you used DS?</b>											
<b>Yes, N</b>	9	137	116	54	316	144	172	316	106	210	316
<b>Column %</b>	50	63.4	62.7	60.0	62.1	63.4	61	62.1	61.3	62.5	62.1
<b>Row %</b>	2.8	43.4	36.7	17.1	100.0	45.6	54.4	100.0	33.5	66.5	100.0
<b>No, N</b>	9	79	69	36	193	83	110	193	67	126	193
<b>Column %</b>	50	36.6	37.3	40.0	37.9	36.5	39	37.9	38.7	37.5	37.9
<b>Row %</b>	4.7	40.9	35.8	18.7	100.0	43.0	57.0	100.0	34.7	65.3	100.0
<b>Total, N</b>	18	216	185	90	509	227	282	509	173	336	509
<b>Do you believe that DS have benefits?</b>											
<b>Yes, N</b>	13	167	141	69	390	179	211	390	136*	254	390
<b>Column %</b>	72.2	77.3	76.2	76.7	76.6	78.9	74.8	76.6	78.6	75.6	76.6
<b>Row %</b>	3.3	42.8	36.2	17.7	100.0	45.9	54.1	100.0	34.9	65.1	100.0
<b>No, N</b>	4	38	36	17	95	40	55	95	24	71	95
<b>Column %</b>	22.2	17.6	19.5	18.9	18.7	17.6	19.5	18.7	13.9	21.1	18.7
<b>Row %</b>	4.2	40.0	37.9	17.9	100	42.1	57.9	100.0	25.3	74.7	100.0
<b>I don't know, N</b>	1	11	8	4	24	8	16	24	13	11	24
<b>Column %</b>	5.6	5.1	4.3	4.4	4.7	3.5	5.7	4.7	7.5	3.3	4.7
<b>Row %</b>	4.2	45.8	33.3	16.7	100	33.3	66.7	100.0	54.2	45.8	100.0
<b>Total, N</b>	18	216	185	90	509	227	282	509	173	336	509

\*P value ≤ 0.05. Carmer's V test showed no association between DS intake and indicators of healthy habits (BMI, Physical activity and being a non-smoker). Carmer's V values < 0.05. DS = Dietary Supplements

**Table 8:** The most common consumed DS by users

Type of DS used*	Male N (%)	Female N (%)	Total N (%)
Multivitamins	118 (40.1)	176 (59.9)	294 (93.0)
Vitamin D	73 (35.1)	135 (64.9)	208 (65.8)
Vitamin C	76 (41.8)	106 (58.20)	182 (57.6)
Vitamin A	38 (45.8)	45 (54.2)	83 (26.3)
Vitamin B	40 (48.2)	43 (51.8)	83 (26.3)
Vitamin B complex	22 (30.1)	51 (69.9)	73 (23.1)
Vitamin E	25 (47.2)	28 (52.8)	53 (16.8)
Vitamin K	16 (50)	16 (50)	32 (10.1)
Body building supplements	44 (71)	18 (29)	62 (19.6)
Sport drinks	31 (68.9)	14 (31.1)	45 (14.2)
Weight loss products	16 (30.2)	37 (69.8)	53 (16.8)
Stimulants	11 (47.8)	12 (52.2)	23 (7.3)
Others (ginseng, ginko, etc.,)	1 (7.1)	13 (92.9)	14 (4.4)

\*Participants were allowed to choose more than one answer as appropriate. DS = Dietary Supplements

**Table 9:** Association between body building supplements and demographic data

	Proteins and body building supplements intake		
	Yes N(%)	No N(%)	Total N(%)
<b>Gender</b>			
<b>Male</b>	44** (32.8)	90 (67.2)	134
<b>Female</b>	18 (9.9)	164 (90.1)	182
<b>Smoking</b>			
<b>Yes</b>	34** (32.1)	72 (67.9)	106
<b>No</b>	28 (13.3)	182 (86.7)	210
<b>Physical activity</b>			
<b>Yes</b>	44** (30.6)	100 (69.4)	144
<b>No</b>	18 (13.9)	154 (89.5)	172
<b>Age</b>			
<b>18-25</b>	39 ** (30)	91 (70)	130
<b>26-30</b>	10 (14.9)	57 (85.1)	67
<b>31-40</b>	10 (12.8)	68 (87.2)	78
<b>&gt;40</b>	3 (7.3)	38 (92.7)	41

\*\*P value  $\leq 0.005$ . Cramer's V value  $> 0.25$  (very strong association) was reported for association of body building supplements intake with gender and physical activity while Cramer's V value  $> 0.15$  (strong association) was reported for association with smoking and age. Only Demographics that have significant association with body building supplements are shown in the table 8



**Table 10:** Association factors with DS use

	User	Non-user	Total
<b>Knowledge about DS</b>			
<b>Yes</b>	293**	114	407
<b>Column%</b>	92.7	59.1	80.0
<b>No</b>	23	79	102
<b>Column%</b>	7.3	40.9	20.0
<b>Total</b>	316	193	509
<b>Acknowledging DS side effects</b>			
<b>Yes</b>	148	90	238
<b>Column%</b>	46.8	46.6	46.9
<b>No</b>	159**	76	235
<b>Column%</b>	50.3	39.4	46.2
<b>I don't know</b>	9	27	36
<b>Column%</b>	2.8	14.0	7.1
<b>Total</b>	316	193	509
<b>Prevention of disease</b>			
<b>Yes</b>	112**	40	151
<b>Column %</b>	35.4	20.7	29.7
<b>No</b>	202	127	329
<b>Column %</b>	63.9	65.8	64.6
<b>I don't know</b>	2	26	29
<b>Column %</b>	0.6	13.5	5.7
<b>Total</b>	316	193	509
<b>Treatment of disease</b>			
<b>Yes</b>	79**	30	109
<b>Column %</b>	25.0	15.5	21.4
<b>No</b>	235	138	373
<b>Column %</b>	74.4	71.5	73.3
<b>I don't know</b>	2	25	27
<b>Column %</b>	0.6	13	5.3
<b>Total</b>	316	193	509

\*\*P value  $\leq 0.005$ . Cramer's V value  $>0.25$  (very strong association was reported for Association of DS intake with knowledge about DS and role of DS in disease prevention and treatment while Cramer's V value  $> 0.15$  (strong association) was reported for association of DS use with the assumption of no side effects. DS = Dietary Supplements

Indeed, more than half of the participants have used DS and these users were mostly females from the age group 30-41 years old. In this regard, our results were in agreement with previous studies, in which the users were mostly females and from older age groups [13].

Many studies worldwide have shown that non-smokers and physically active participants consumed DS at a higher rate [14]. On the contrary, this study results showed no association between using DS and positive habits such as regular exercise and non-smoking. The difference between these reported results and others could be attributed to the high proportion of smokers and social acceptance of smoking in Jordan [15], with 33.5 % of DS users in the current report being smokers. Furthermore, our results showed that exercise is not a regular habit by users as 54.4 % were physically inactive and 53.8 % of the users were with BMI indicating

overweight or obesity. In fact, obesity and overweight are concerning issues in Jordan [16]. Altogether, the belief that DS users are more interested in improving overall health by maintaining healthy habits was shown to be untrue by our results and another Korean study [4].

Based on findings from this study and others [3], the reason(s) for the intake of DS were mainly to overcome a deficiency or to improve health and wellbeing. The most DS used were in the form of multivitamins followed by vitamin D and/or vitamin C. The benefits of DS use are well documented in case of nutrients deficiencies [1].

The use of DS by the participants to prevent or treat diseases was low. However, these results were expected since the majority of them did not believe in the role of DS in reducing the risk of diseases or treating them. Furthermore, they

were mostly uneducated about which DS are involved in disease prevention and/or treatment. Few studies have shown that DS can reduce the risk of chronic diseases [17]. Nonetheless, others have reported that the use of DS to treat or prevent diseases in healthy individuals without nutrients deficiencies is questionable and might be a health concern [18]. For instance, the use of vitamin E increased the risk of prostate cancer as shown in a follow-up study conducted on 35,533 men from the USA, Canada, and Puerto Rico for 4 years [19].

In regard to source of influence for DS intake, most of the participants of this study consumed DS by self-prescription, which might put them at risk of developing potential side effects. This self-prescription could be related to the fact that DS are advertised to be generally safe. Lam *et al* have reported similar results to our study, in which 84.4 % users were using self-prescribed DS [20]. DS users in present survey either did not seek information on supplements or if they did it was mostly from non-reliable sources such as social media and friends rather than healthcare providers. Consistent with these results, Alfawaz *et al* have shown that social media was the most common source of information about DS [21].

Our results showed that about half of our DS users were not aware of potential side effects; this awareness was significantly higher among medical participants and physically active participants. Jovanov *et al* have shown in their international study that the majority of young athletes (72.1 %) who were using DS to enhance body image were aware of health risks associated with body building supplements use, nonetheless this did not stop them of using the supplements [22]. In reference to the usage of body building supplements, such as creatine and chained amino acids, our results showed higher intake among physically active participants and males. Therefore, advising physically active people about natural resource alternatives to enhance sports performance and body image is recommended to reduce the possible risks associated with the use of body building supplements. It is well documented that exceeding the normal required level of nutrients has its own risks. Many studies have shown that using DS in excess can result in a different range of side effects; as simple as diarrhea to a more serious risk of liver injury and cancer [5].

Based on current evidence of DS use with reference to its possible side effects, the public should always be encouraged to seek medical advice from trustworthy and reliable resources.

Therefore, supplement intake should not be initiated before health care providers' recommendations; based on results from biochemical laboratory assays. This is highly valuable to avoid any harmful effects that might result from exceeding the normal levels of vitamins and minerals.

### **Limitations of the study**

The present study has some limitations that should be considered. Our findings were from participants from 4 major cities in Jordan and therefore to have better generalization of the results, further studies including other parts of Jordan should be included.

### **CONCLUSION**

DS users are more likely to take supplements on their own instead of consulting healthcare providers. Consequently, when this self-recommended use of DS is linked with their personal belief that DS are free from any side effects and can treat or prevent a disease, the risks of DS use might outweigh the benefits, leading to negative health consequences. Therefore, it is recommended that the public should be educated about the advantages and disadvantages of DS, by implementing educational programs mainly through healthcare providers as they are the most accessible professionals to the public and have more opportunities to make a significant impact in these settings.

### **DECLARATIONS**

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#### **Conflict of interest**

The authors declare that they have no conflict of interest with regard to this work.

#### **Contribution of authors**

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors Each author has contributed to the work as follow: Haneen A. Basheer: Conceptualization, Methodology, Writing- Original draft preparation, Formal analysis, Software, Project administration, Supervision, Data curation, Visualization. Lina

Elsalem: Writing- Original draft preparation, Methodology, Resources, Writing Review & Editing, Visualization. Deema Jaber: Data curation, Formal analysis, Writing - Review & Editing. Shorouk M. Ibraheem: Methodology Data entry, Data entry into SPSS, Writing - Review & Editing. Hamza: Alhamad: Methodology, Writing - Review & Editing. Ahmad A Jum'ah: Visualization Writing - Review and Editing.

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