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Understanding the Use, Advantages, and Risks of Dietary Supplements among Students in an Educational Context

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Abstract

Background: The outbreak of COVID-19 gives a profound impression on the people regarding the maintenance of health and the awareness of sustaining good health. An approach that is practiced is consuming dietary supplements to maintain good health, albeit Malaysia has moved into endemic stage of the COVID-19. Considering the significance and extensive use of dietary supplements, it is imperative for prospective healthcare practitioners to have comprehensive knowledge regarding the advantages and potential drawbacks associated with these products. Accordingly, this study was conducted to study the knowledge, awareness, benefits and risks of dietary supplements in students of Universiti Teknologi MARA Cawangan Pulau Pinang Kampus Bertam. Methods: Diploma of Pharmacy students were included in an online questionnaire that consisted of 29 questions. The questionnaire comprises of four sections; Section A, Section B, Section C and Section D. The data was analyzed using SPSS version 25. Results: A total of 88.05% response rate was achieved. 89.6% of the students were aware about dietary supplements and the most common sources they heard about dietary supplements are from the media followed by information circulated by the university. 62.5% of students agreed that the intake of dietary supplements aids in treating people infected with COVID-19. Majority of the students, which is 36.4%, started

taking dietary supplements after COVID-19 outbreak occurred and the most common type of dietary supplement consumed was Vitamin C. Their primary reasons for taking dietary supplements is to boost immunity. The students agreed that high dose or too many dietary supplements might cause risks to the body. 83.2% agreed that some dietary supplements might negatively interact with medicines. The students show good perceptiveness and awareness towards the safety and risks of dietary supplements.

Introduction

Dietary supplement (DSs) is defined as vitamins, minerals, herbal products, or chemical substances that are consumed to improve health (Alqrache et al, 2021). There are various types of DSs such as Vitamin C, folic acid, calcium, caffeine, creatine, iron, omega 3 and others. Currently, it is easy to buy and get dietary supplements anywhere as they are available in the market and advertised online widely. They also come in several forms such as tablets, capsules, powders, drinks, and energy bars. . Even though a product is marketed as a DSs, it is still considered a medicine to the degree that it is meant to treat, diagnose, cure, or prevent illnesses. The most typical supplements that are available are vitamins, amino acids, herbs, botanical compounds, minerals, and probiotics.

Dietary supplements can be found in many forms such as soft gel, liquid, capsules, tablets, powders, gummies, and more DSs are commonly consumed depending on health status, age, physical activity, gender, and illness prevention. The use of dietary supplements will bring benefits to general health if they are used as suggested (Naqvi et al., 2018). However, the excess use of DSs can bring adverse effects to health.

The World Health Organization (WHO) declared COVID-19 outbreak as a pandemic. COVID-19 is an infectious disease caused by the SARS-COV-2-virus and most of those who are infected will most likely experience mild to moderate respiratory illness and can get better without needing any special treatments. Nonetheless, some people get seriously ill and require immediate medical attention. Although Malaysia has transitioned into endemic status following the effectiveness of prevention and control measures, public still needs to be vigilant to ensure that the transmission of the virus remains low.

The outbreak of COVID-19 affect people regarding the importance of maintaining good health. The awareness of sustaining good health has been rising among the people and one approach that has been practiced is consuming supplements. In many countries, the consumption and sales of DSs has increased due to the wake of COVID-19 (Hamulka et al., 2020).

Indeed, there is an increasing demand for dietary supplements especially after the outbreak due to rising issues related to health, changing eating habits, physical inactivity, busy work schedules which can increase the intake of junk and fast food that are unhealthy and less nutritional resulting in improper dieting (Aliyu et al.,2020; Mukattash et al., 2022). Consequently, serious issues with consumers were raised regarding consumer knowledge related to dietary supplements and the reasons for consuming dietary supplements.

The intake of types of DSs during COVID-19 outbreak consisted of several factors such as to boost immunity, correction of deficiency, focus enhancement, muscle bulking, for energy, weight loss and weight gain. The students might have different opinions regarding the types of and reasons for their consumption of DSs. Thus, this study is conducted to observe the knowledge, use, safety, and risk of dietary supplements among students in UiTMCPP Bertam Campus during COVID-19 outbreak. The objectives of this study are to evaluate the knowledge of DSs, to identify the most common type of DSs used along with

their motives and to assess the students' awareness regarding the safety and risks of DSs among the students.

Methodology

Diploma of Pharmacy students in Universiti Teknologi MARA, Cawangan Pulau Pinang Kampus Bertam were included in the study. With reference to previously published research (Aina and Ojedokun, 2014; Yana Toshkova et al, 2017; Pillitteri JL et al, 2008 and Timbo et al, 2006), an online questionnaire was developed using Google Form to be distributed to the students.

The questionnaire comprised of four sections; Section A, Section B, Section C and Section D with a total of 23 questions. Firstly, section A contains questions regarding socio-demographic data followed by section B about knowledge on dietary supplement. Section C contains questions regarding usage of dietary supplements. All of these questions are adapted and modified from a previous study (Aina and Ojedokun, 2014). Lastly section D consists of questions about safety and risk of DSs which were adapted and modified from a previous study (Yana Toshkova et al, 2017).

The questionnaire was distributed to all students. All statistical analyses were performed using the Statistical Package for Social Studies (SPSS) version 25.0 software. To visualise and evaluate the data, cross-tabulations and descriptive statistics were utilised. The fundamental characteristics of the gathered data were summarised using descriptive statistics data analysis. The Kolmogrov-Sminov test was used to determine the data normality. To examine the relationship between the variables, the chi square statistical test was used. P-value ≤.05 was considered statistically significant

Results and Discussion

280 students out of 318 completed the questionnaire (response rate 88%). Table 1 presents the socio-demographic data of the respondents. 81.4% respondents were female while the remaining (18.6%) were male. The respondents of this survey consisted of (23.2%) year 1 students, (33.6%) year 2 students and (43.2%) year 3 students.

Table 1: Sociodemographic data of respondents. A total of 280 Diploma of Pharmacy students were included in the study.

Variable	N	Percentage (%)
Gender		
Male	52	18.6
Female	228	81.4
Age		
18	2	0.7
19	58	20.7
20	84	30
21	105	37.5
22	16	5.7
23	15	5.4
Year of study		
1	65	23.2
2	94	33.6
3	121	43.2

Table 2 contains data on knowledge about dietary supplements among students. Almost all participants (89.6%) have heard about dietary supplements and their major source of information was from media (37.4%), university (19.4%), parents (17%), book (16.9%) and doctor (9.3%). Almost half of respondent said that dietary supplement cannot be used to substitute natural nutrient derived from foods and 62.9% students agreed that natural dietary supplements are better than man made supplements. Majority of students thought that there are side effects when consuming dietary supplements and that DSs can be harmful to health. Regarding knowledge about dietary supplements related to COVID-19, (62.5%) respondents think that taking DSs aids in treating COVID-19 patients and (51.8%) think that DSs may reduce the chance of getting COVID-19 (Table 2).

When gender was cross tabulated with some factors related to knowledge of DSs, there was no significant difference between male and female regarding the follows:

i) whether DSs cannot be used to substitute natural nutrient derived from foods (p= 0.266); can dietary supplements be harmful to health (p=0.446)
ii) taking dietary supplement can treat COVID-19 patients (p=0.861)
iii) reduce chances of getting COVID-19 (p=0.166).

However, there was a statistically significant difference between gender regarding whether natural dietary supplements are better than man made supplements (p=0.01) and there is side effect when consuming DSs (p=0.032).

Majority of year 1(93.8%), year 2 (86.2%) and year 3 (90.1%) have heard about dietary supplements. There was no significant difference between year 1, year 2 and year 3 students regarding heard about dietary supplements, DSs are important, taking DSs can help in treating a person infected with COVID-19 and DSs may reduce chances of getting COVID-19. However, there were statistically significant differences (p<0.05) between years of study regarding dietary supplements that cannot be used to substitute natural nutrients derived from foods, natural dietary supplements are better than man made supplements, use of DS can cause side effects and DS can be harmful to health.

Table 2: Knowledge and use of dietary supplements in Diploma of Pharmacy students*p-value (<0.05) is considered statistically significant.

Question	Gender			Year			
	Female N (%)	**Male N (%)**	**p-value**	**1 N (%)**	**2 N (%)**	**3 N(%)**	**P value**
Have you heard about dietary supplements?							
Yes	208 (91.2%)	43 (82.7%)	0.190	61 (93.8%)	81 (86.2%)	109 (90.1%)	0.177
From which sources have you heard about dietary supplements?							
University	97 (42.5%)	26 (50.0%)	0.328	24 (36.9%)	46 (48.9%)	53 (43.8%)	0.324
Media	197 (86.4%)	40 (76.9%)	0.087	57 (87.7%)	80 (85.1%)	100 (82.6%)	0.653
Parents	83 (36.4%)	25 (48.1%)	0.119	24 (36.9%)	43 (45.7%)	41 (33.9%)	0.198
Doctor	46 (20.2%)	13 (25.0%)	0.441	9 (13.8%)	21 (22.3%)	29 (24.0%)	0.254

Book	82 (36.0%)	25 (48.1%)	0.105	18 (27.7%)	40 (42.6%)	49 (40.5%)	0.131
Dietary supplement cannot be used to substitute natural nutrients derived from foods							
Yes	127 (55.7%)	32 (61.5%)	0.266	41 (63.1%)	57 (60.6%)	61 (50.4%)	0.030*
Natural dietary supplement are better than manmade supplements?							
Yes	153 (67.1%)	23 (44.2%)	0.01*	39 (60.0%)	57 (60.6%)	80 (66.1%)	0.018*
Are dietary supplements important?							
Yes	124 (54.4%)	29 (55.8%)	0.768	30 (46.2%)	57 (60.6%)	66 (54.5%)	0.103
There are side effects to dietary supplement use							
Yes	177 (77.6%)	33 (63.5%)	0.032*	52 (80.0%) 80 (85.1%)		78 (64.5%)	0.000*
Can dietary supplements be harmful to health?							
Yes	164 (71.9%)	35 (67.3%)	0.446	54 (83.1%)	75 (79.8%)	70 (57.9%)	0.000*
Do you think that taking dietary supplements helps in treating a person infected with COVID-19?							
Yes	141 (61.8%)	34 (65.4%)	0.861	41 (63.1%)	60 (63.8%)	74 (61.2%)	0.821
Do you think that taking dietary supplements may reduce your chance of getting COVID-19?							
Yes	112 (49.1%)	33 (63.5%)	0.166	25 (38.5%)	55 (58.5%)	65 (53.7%)	0.062

The use of dietary supplements by students is shown in Table 3. Among 188 DSs users, it was found that both gender, female (N=94) and male (N=8) started consuming DSs after COVID-19 outbreak and it was found that both genders are statistically significant (p=0.000). Both groups chose Vitamin C as a frequent type of DSs used and there was statistically significant difference between groups (p=0.00). In addition, male is statistically significance reported taking sports drinks (p=0.000) amino acid /protein, and caffeine (p=0.001) more than females. The reasons for both genders to start taking DSs which are for relief of fatigue (p= 0.012), for energy (p=0.031), and to boost immunity (p=0.000) were found statistically significant. Regarding the side effects experienced, male reported having sleep disturbances (46.9%) and palpitation (40.6%) more than females and mostly both genders do not have any side effects yet when consuming DSs in their life. Majority for both genders are categorized as a daily DSs users as female (46.2%) and male (40.6%).

There are (30.7%) of students taking dietary supplements before COVID-19 outbreak occurred, (36.4%) taking after COVID-19 outbreak occurred and the remaining (32.9%) never taking any type of dietary supplements in their life. Vitamin C (23.2%) was commonly consumed among students, followed by (10.5%) multivitamin and (8.9%) calcium. The primary reasons students consume DSs were to boost immunity (28.4%), for energy (21.1%), 14.7% for relief of fatigue and correction of nutrient deficiency.

Among the consumers only (15.5%) of them had sleep disturbances, (10%) experienced palpitation, (8.2%) experienced mood changes, (4.6%) have generalized fatigue and (2.7%) suffered muscle pain as a side effect after taking DSs,. However, majority of the respondents

reported no side effects. Among the students, (45.2%) take DSs daily, (29.8%) take it weekly, (17.6%) are occasional and 5.3% once in a while. More than half of respondents (58%) recommend DSs to others and when asking about their opinion towards DSs, majority of them (51.8%) agree that DSs improve health.

Meanwhile (23.6%) students said that DSs are harmless. Year 1 (13.8%), year 2 (30.9%) and year 3 (22.3%) expressed that DSs are harmless. As a result, there is a significant difference between year of study and DSs are harmless (p-0.042) (Table 3).

Table 3: Factors associated with the use of dietary supplements in Diploma of Pharmacy students. **p-value (<0.05) is considered statistically significant.

Question	Gender			Year			
	Female N (%)	**Male N (%)**	**p-value**	**1 N (%)**	**2 N (%)**	**3 N(%)**	**P value**
When did you start taking dietary supplements?							
Before COVID-19 outbreak	62 (27.2%)	24 (46.2%)	0.070	22 (33.8%)	30 (31.9%)	34 (28.1%)	0.687
After COVID-19 outbreak	94 (41.2%)	8 (15.4%)	0.000*	16 (24.6%)	38 (40.4%)	48 (39.7%)	0.078
Never take dietary supplements	72 (31.6%)	20 (38.5%)	0.340	27 (41.5%)	26 (27.7%)	39 (32.2%)	0.183
Common type of dietary supplement used.							
Vitamin C	141 (90.4%)	21 (65.6%)	0.000*	30 (78.9%)	60 (88.2%)	72 (87.8%)	0.352
Vitamin B group	47 (30.1%)	9 (28.1%)	0.821	12 (31.6%)	27 (39.7%)	17 (20.7%)	0.039*
Vitamin D	35 (22.4%)	9 (28.1%)	0.489	8 (21.1%)	16 (23.5%)	20 (24.4%)	0.922
Multivitamin	64 (41%)	9 (28.1%)	0.173	9 (23.7%)	18 (26.5%)	46 (56.1%)	0.000*
Amino acid / protein	9 (5.8%)	8 (25.0%)	0.001*	3 (7.9%)	8 (11.8%)	6 (7.3%)	0.616
Caffeine	20 (12.8%)	12 (37.5%)	0.001*	9 (23.7%)	13 (19.1%)	10 (12.2%)	0.252
Calcium	54 (34.6%)	8 (25.0%)	0.292	17 (44.7%)	27 (39.7%)	18 (22.0%)	0.016*
Creatine	4 (2.6%)	1 (3.1%)	0.857	1 (2.6%)	2 (2.9%)	2 (2.4%)	0.982
Energy drinks	46 (29.5%)	13 (40.6%)	0.216	16 (42.1%)	27 (39.7%)	16 (19.5%)	0.008*
Folic acid	41 (26.3%)	2 (6.3%)	0.014*	11 (28.9%)	16 (23.5%)	16 (19.5%)	0.513
Herbal supplements	39 (25.0%)	4 (12.5%)	0.125	10 (26.3%)	20 (29.4%)	13 (15.9%)	0.123
Iron	22 (14.1%)	3 (9.4%)	0.473	4 (10.5%)	10 (14.7%)	11 (13.4%)	0.831

Magnesium	8 (5.1%)	1 (3.1%)	0.629	1 (2.6%)	2 (2.9%)	6 (7.3%)	0.359
Omega 3	37 (23.7%)	3 (9.4%)	0.071	9 (23.7%)	20 (29.4%)	11 (13.4%)	0.054
Sports drinks	11 (7.1%)	9 (28.1%)	0.000*	6 (15.8%)	9 (13.2%)	5 (6.1%)	0.190
Zinc	7 (4.5%)	1 (3.1%)	0.728	2 (5.3%)	1 (1.5%)	5 (6.1%)	0.355
Primary reasons for dietary supplement.							
Relief of fatigue	60 (38.5%)	20 (62.5%)	0.012*	17 (44.7%)	40 (58.8%)	23 (28.0%)	0.001*
For energy	90 (57.7%)	25 (78.1%)	0.031*	20 (52.6%)	39 (57.4%)	56 (68.3%)	0.189
To boost immunity	138 (88.5%)	17 (53.1%)	0.000*	31 (81.6%)	53 (77.9%)	71 (86.6%)	0.378
Weight gain	23 (14.7%)	3 (9.4%)	0.423	3 (7.9%)	11 (16.2%)	12 (14.6%)	0.477
Weight loss	18 (11.5%)	3 (9.4%)	0.723	3 (7.9%)	9 (13.2%)	9 (11.0%)	0.702
Doctor's prescription	-	-	-	-	-	-	-
Focus enhancement	18 (11.5%)	6 (18.8%)	0.265	7 (18.4%)	9 (13.2%)	8 (9.8%)	0.412
Muscle bulking	14 (9.0%)	5 (15.6%)	0.256	7 (18.4%)	7 (10.3%)	5 (6.1%)	0.114
Bone health	33 (21.2%)	8 (25.0%)	0.631	11 (28.9%)	20 (29.4%)	10 (12.2%)	0.019*
Correction of deficiency	58 (37.2%)	7 (21.9%)	0.097	18 (47.4%)	31 (45.6%)	16 (19.5%)	0.001*
Other	-	-	-	-	-	-	-
Do you take prescription medication with dietary supplements?							
Yes	20 (12.9%)	3 (9.4%)	0.833	1 (2.7%)	8 (11.8%)	14 (17.1%)	0.081
Do you take Over the Counter (OTC) medication with dietary supplements?							
Yes	25 (16.0%)	2 (6.3%)	0.306	4 (10.5%)	5 (7.4%)	18 (22.0%)	0.028*
What are the side effect experienced?							
Sleep disturbance	19 (12.2%)	15 (46.9%)	0.000*	5 (13.2%)	17 (25.0%)	12 (14.6%)	0.176
Palpitation	9 (5.8%)	13 (40.6%)	0.000*	3 (7.9%)	12 (17.6%)	7 (8.5%)	0.161

Mood changes	12 (7.7%)	6 (18.8%)	0.053	1 (2.6%)	7 (10.3%)	10 (12.2%)	0.246
GIT effects (nausea vomiting, diarrhea, constipation)	12 (7.7%)	3 (9.4)	0.749	2 (5.3%)	8 (11.8%)	5 (6.1%)	0.349
Generalized fatigue	10 (6.4%)	0	0.141	3 (7.9%)	4 (5.9%)	3 (3.7%)	0.609
Muscle pain	4 (2.6%)	2 (6.3%)	0.280	0	4 (5.9%)	2 (2.4%)	0.224
None	113 (72.4%)	16 (50.0%)	0.013*	26 (68.4%)	43 (63.2%)	60 (73.2%)	0.426
Frequency of use							
Daily	72 (46.2%)	13 (40.6%)	0.826	19 (50.0%)	34 (50.0%)	32 (39.0%)	0.058
Weekly	46 (29.5%)	10 (31.3%)		8 (21.1%)	18 (26.5%)	30 (36.6%)	
Occasionally	26 (16.7%)	7 (21.9%)		7 (18.4%)	14 (20.6%)	12 (14.6%)	
Once in a while	8 (5.1%)	2 (6.3%)		1 (2.6%)	2 (2.9%)	7 (8.5%)	
Do you recommend dietary supplements to others?							
Yes	131 (61.8%)	32 (69.9%)	0.202	25 (46.3%)	59 (67.0%)	79 (68.1%)	0.019*
Opinion about dietary supplements							
Necessary for all ages	49 (21.5%)	10 (19.2%)	0.718	10 (15.4%)	16 (17.0%)	33 (27.3%)	0.083
They are harmless	49 (21.5%)	16 (30.8%)	0.153	9 (13.8%)	29 (30.9%)	27 (22.3%)	0.042*
Regular use of dietary supplements can prevent chronic diseases	29 (12.7%)	11 (21.2%)	0.117	5 (7.7%)	17 (18.1%)	18 (14.9%)	0.178
Dietary supplements improve health	124 (54.4%)	19 (36.5%)	0.020*	33 (50.8%)	44 (46.8%)	66 (54.5%)	0.530
No opinion	55 (24.1%)	10 (19.2%)	0.451	19 (29.2%)	20 (21.3%)	26 (21.5%)	0.423

Table 4 shows the results on safety and risk related to dietary supplement. Majority of students (85.4%) agree that high doses or many different dietary supplements taken by a person may expose bad reactions to the body. About (83.2%) respondents also think that some dietary supplements interact with some medicines in ways that might cause problems. Most of them (87.5%) agreed that they should inform healthcare providers if they experience any bad reactions when consuming dietary supplements and (86.8%) agreed that before consuming any DSs they should be aware about the specific product safety concern. Around (73.6%) students also think that it is illegal to market a dietary supplement as a treatment or cure for a specific disease or condition and (85.7%) said yes that it is necessary for all ingredients to be listed on the label of DSs products.

When gender were cross tabulated with safety and risk of DS, there were significant difference between male and female regarding the follows:

i) high dose or many different DS may expose bad reactions to the body (p=0.018),
ii) informing healthcare provider if experience any bad reaction when taking DS (p=0.002),
iii) people should be aware of DS product safety concern before consuming it (p=0.000), iv) it is necessary for all ingredients to be listed on the label of DS products (p=0.000).

Meanwhile, there was no statistically significant difference between gender with some DS interacting with some medicines in a way that might cause problems (p=0.09), and it is illegal to market a DS as a treatment or cure for a specific disease or condition (p=0.281).

Table 4: Knowledge on safety and risk of dietary supplements usage by Diploma of Pharmacy. *p-value (<0.05) is considered statistically significant.

Question	Gender			Year			
	Female	**Male**	**P value**	**1**	**2**	**3**	**P value**
High dose or many different dietary supplements expose bad reactions to the body							
Yes	201 (88.2%)	38 (73.1%)	0.018*	62 (95.4%)	76 (80.9%)	101 (83.5%)	0.97
Some dietary supplements interact with some medicines in a way that might cause problems							
Yes	197 (86.4%)	36 (69.2%)	0.09	62 (95.4%)	76 (80.9%)	95 (78.5%)	0.040*
Should inform the healthcare provider if experience any bad reactions when taking supplement – further report to FDA							
Yes	207 (90.8%)	38 (73.1%)	0.002*	64 (98.5%)	77 (81.9%)	104 (86.0%)	0.004*
People should be aware of specific dietary supplement product safety concern before consuming it							
Yes	206 (90.4%)	37 (71.2%)	0.000*	63 (96.9%)	79 (84.0%)	101 (83.5%)	0.025*
It is illegal to market a dietary supplement as a treatment or cure for a specific disease or condition							
Yes	171 (75.0%)	35 (67.3%)	0.281	57 (87.7%)	68 (72.3%)	81 (66.9%)	0.040*
It is necessary for all ingredient to be listed on the label of dietary supplement products?							
Yes	205 (89.9%)	35 (67.3 %)	0.000*	61 (93.8%)	80 (85.1%)	99 (81.8%)	0.282

Discussion

According to Rowe and Toner (2003), information on supplement were obtained from a variety of sources, including health professionals such doctor, pharmacist and more but most frequently the media. This finding is in line with the findings we obtained, which showed that most students chose the media as the main source from which they heard about dietary supplements. This may be because, media frequently makes it simpler and easier to interact, offer information, and acquire information. For instance, social media such as Instagram, Facebook, Telegram, and others. Besides, according to the new study by Rizvi et al. (2019), in recent years, the internet has become a major source of health information, giving people a chance to search for free health information online. A Pew Research Centre report says that 80% of people who use the internet have looked for health information online.

According to Aina & Ojedokun (2014), in their survey, over two thirds of the participants claimed that DSs could replace naturally occurring nutrients found in diet. This indicates some knowledge deficiency because DSs are meant to supplement and not replace natural nutrients from food This finding is contrast with the findings we obtained, which showed that most students have said DSs cannot be used to substitute natural nutrients derived from food. This shows that they understood and knew that DSs are not meant to replace food. They cannot duplicate the nutrients and health advantages of entire foods, such as fruits and vegetables.

Thiel (2001) says that people tend to label those who say that natural vitamins are better than synthetic ones. However, both history and modern science support the idea that natural vitamins are better for your health. Dietary supplements that are made in a lab or factory are called "synthetic nutrients" or "man-made supplements." The only natural nutrients come from whole foods. This is like what we found in our study in which most students are aware that natural DSs are better than man made supplements. Natural supplements have the same vitamins and minerals that are found in natural foods, but in much higher amounts. When we add natural supplements to our diet, we will get the real nutrition that we should have gotten from a healthy diet.

According to Hamulka et al. (2021), DSs could always reduce the chance of getting COVID-19 infection and could help in treating a person who is infected with COVID-19. This is similar to our finding that the majority of students agreed that taking DSs could help in treating a person infected with COVID-19. Besides, most of the students in our study are also aware that taking DSs could reduce chances for getting COVID-19. According to a new study by Louca (2021), regular use of specific vitamins and supplements may reduce women's chance of getting COVID-19. According to new research, women who use DSs such multivitamins, probiotics, omega-3 fatty acids, and vitamin D supplements had a decreased risk of contracting COVID-19.

According to Hamulka et al. (2021), the usage of DSs in most countries has been rising due to the wake of COVID-19. This coincides with our finding where most Pharmacy students start taking DSs after COVID-19 outbreaks occurred. The rationality of this is the intake of DSs aids in preventing them from getting infected or to treat them who are infected (Radwan et al., 2022). People have a variety of reasons for consuming dietary supplements after COVID-19 outbreaks. For instance, to boost immunity, focus enhancement, for energy and relief of fatigue. Based on the results gathered, it is noticeable that females are more likely to consume dietary supplements compared to males. This aligns with the finding of Alqrache et al. (2021), that stated higher usage of iron supplements by the woman during their menstruation compared to males.

Our study shows that the highest type of DSs used is Vitamin C followed by multivitamin and calcium. This result differs with the study conducted by Alqrache et al. (2021), in which the most common types of DSs consumed by the students in King Abdulaziz University are multivitamin and minerals. From the same study, it is shown that more men use DSs for performance enhancement and for muscle bulking. This explains most of our male respondents were reported for consuming amino acid/proteins, sports drinks, and energy drinks more than the female. Our findings also reported higher usage of DSs in females compared to the male. This shows that female are more health conscious and the increased use of DS such as, calcium, multivitamin, iron, and omega 3 in their regular activities can help them maintain their hair's condition, their bones' health, prevent disease and bone injuries, and prevent osteoporosis in the future. (Alfawaz et al., 2020).

The primary reason reported for taking DSs in our research is to boost immunity. This explains the high percentage usage of Vitamin C among the students. Vitamin C or also known as Ascorbic acid is an antioxidant that functions to boost the immunity. It is postulated that the rising intake of Vitamin C is associated with the COVID-19 outbreak because the use of antioxidant supplements may help fight the coronavirus (Shahbaz et al., 2022). Our survey reported that most Year 3 students consumed DSs mainly for energy compared to Year 1 and Year 2 students. Since Year 3 students are currently completing their internship for almost 10 months in the hospital, it is assumed that the consumption of DSs aids them in providing energy. In addition, Year 3 students need to attach to many Pharmacy Departments in the hospital such as Outpatient, Inpatient, Manufacturing Pharmacy and Health Clinic as a completion for their internship. This surely makes them feel exhausted and the consumption of DSs assists them to gain more energy.

Over the counter (OTC) medication is the most common intake by people especially in these COVID-19 outbreaks to maintain their healthy well-being. Our study recorded that most of the students do not consume DSs together with OTC medications. In accordance with Aina & Ojedokun (2014), this high percentage of not consuming DSs and OTC medication at once suggested that less adverse reactions encountered by the students. This result was distinct from the study that was conducted by Masumoto et al. (2018), where the concurrent use of OTC medication with DSs was ordinary in older patients who are suffering from chronic illness. The Pharmacy students of UiTMCPP Bertam Campus ages' range from 18 to 23 years old, hence they are unlikely to develop chronic illness yet like people in older age do and that is why the concurrent use of DSs, and OTC medication is low.

Based on the results collected, most of the students reported that they do not experience any side effects while consuming DSs. However, some of them did encounter some side effects. The most reported side effect was sleep disturbance. This may be caused by the consumption of caffeine to stay awake to study for the upcoming tests or completing their assignments for Year 1 and Year 2 students while for Year 3 students, they may complete the Final Year Project (FYP). The result that has been obtained from this survey matches with the study conducted by Alqrache et al. (2021) as the students also reported sleep disturbance was the most common side effects encountered. In our study, palpitation reported in male is higher than females. Alqrache et al. (2021) stated that this could be caused by the larger quantity of energy drinks consumed by males which caused that symptom compared to females.

Based on this survey, most of the students consumed DSs daily followed by weekly and only a few of them use DSs once in a while. This result contrasts with the findings of Aina & Ojedokun (2014) in which most of the respondents responded they use DSs occasionally. This

outcome may be a consequence of the high percentage of Vitamin C usage, which requires daily dosing. Majority of Pharmacy students assume that DSs improve health followed by being harmless and have no opinion towards DSs. The majority of the students' opinions indicate that they have obtained good results and experience desirable effects after consuming dietary supplements. This aligns with the finding of the study conducted by Naqvi et al. (2018), that most of the students that belong to the health cluster have the same opinion, which they agreed that DSs enhance their well-being. Those who believe that DSs are harmless show that they are not experiencing severe side effects while consuming them.

Most students understood that high doses or many different dietary supplements expose bad reactions to the body. This measures that the students will seek for education for validation or meet medical practitioners before taking or adding new supplements to avoid those cases. It is proven in a review article by Toshkova et al. (2017), mega-doses occurred due to three reasons which are adding DSs into treatment without healthcare professionals' consultation, DSs are sold freely without prescription needed and quick access to the products.

Majority students are aware that the interaction between some dietary supplements and some medicines might cause harm to their body. This indicates that medical practitioners provide sufficient counselling and education to them before prescribing new medications. On the other hand, a study of Sood et al., (2008), out of 76 cancer patients, 27% of them were reported to have an interaction potential between vitamins or herbal products with chemotherapeutic agents. However, none of them was hospitalised or experienced serious bleeding due to interactions that were documented.

Most students in our study agreed that people should be aware of the safety of specific dietary supplement product before consuming it. This result showed that they are aware and do not support the advantage given to the DSs' manufacturers, in which their products do not have to go through strict procedures just like medicines before being marketed and have not been well tested for safety especially in children, nursing moms and pregnant women. Meanwhile, based on the study of Axon et al. (2017), only a minority of their respondents who were also students agreed that once dietary supplements are on the market, FDA should keep an eye on their safety and efficacy..

An average of (72%) of students understood that it is illegal to market a dietary supplement as a treatment or cure for a specific disease or condition. This result indicates that they use DSs to supplement their diet and not to replace the work of medications to cure their disease depending on advice from the medical professionals. This is because, based on a study by Mostafavi and Hosseini (2015), there are some clinicians that included supplements such as vitamin C, lipoic acid, carotenoids, or polyphenols among Alzheimer's Disease patients as their treatment and prevention.

Most students agreed that it is necessary for all ingredients to be listed on the label of dietary supplement products. It is a good awareness, which shows their concern towards things that will enter their body, which will affect their body function. Meanwhile, students in the study of Axon et al. (2017) reported that information provided on labels is not helpful to inspect whether it is the right supplement to use or not.

Conclusion

To conclude, majority of students know about DSs, mostly from the media. Students have good knowledge regarding the role and side effects of DSs. Despite most of them agreed that DSs is helpful in treating COVID-19 patients, only some of them support that DSs may

reduce the risk of getting COVID-19. Many students start taking DSs after COVID-19 outbreak compared to before COVID-19 outbreak. Most of them chose vitamin C as their dietary supplement. They take DSs with reasons to relieve fatigue, to enhance immunity function and for energy. Majority of them do not take prescription and OTC medication with DSs concomitantly. Majority of them take DSs every day and have not experienced any side effects. They review that DSs improves health, thus they recommend DSs to others.

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