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Comparison of Dietary Supplements Consumption Between Female University and National Team Sports Athletes in Malaysia

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Abstract. Dietary supplement consumption had already become well known among athletes especially those who were involved in team sports to enhance performances, health benefits, and nutritional strategies. This study aimed to determine the difference in dietary supplement consumption between the female university and national team sports athletes in Malaysia. The Dietary Supplement Questionnaire was used to compare the participants' dietary supplements usage and it was distributed online via a Google Form. Results from this study showed there was no significant difference in the usage of individual vitamins/minerals. However, based on frequency, the usage of vitamin C was the most popular among these groups. Next, there was a significant difference in the usage of protein powder ($t = -2.435$, $df = 61$, $p < 0.018$) and creatine ($t = -2.192$, $df = 61$, $p < 0.032$) between the female university and national athletes. After that, there was a significant difference in usage of other supplements and sports aid which was fish oil/omega 3 ($t = -1.466$, $df = 61$, $p < 0.032$). The national athletes showed higher consumption of dietary supplements compared to the university athletes due to their higher level of competition, energy requirement, and long-time of training.

Key words: Dietary supplements, athletes, team sports

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INTRODUCTION

Dietary supplements are a source of nutrients that can change body composition or increase physical performance (Keat et al, 2017) as well as improve nutritional strategy (Knapik et al, 2016). According to Dietary Supplement Health and Education Act (DSHEA) 1994, the dietary supplement also can be defined as products that consider supplementing the diet and contains minerals, vitamins, protein, herbs, and amino acid (Nabuco et al, 2017). There were divided into three categories: nutrition supplements, sports foods, and ergogenic supplements (Wardenaar et al, 2017), and come in various forms in the marketplace such as tablets, powder, gels, bars, liquid, and capsules.

The usage of dietary supplements was already well-known and common among athletes nowadays as a strategy to enhance performances or specific health benefits (Maughan et al, 2018) and also to apply better nutritional strategies for them (Knapik et al, 2016). An athlete has unique nutritional requirements even though there was no specific set of recommendations for them (Elias et al, 2017; Spendlove et al, 2012). According to Muwonge et al, (2017), there were some athletes who practiced with only their diets and could not have adequate nutrients to support their body's needs. Hence the reason most athletes consume dietary supplements is to promote recovery, and performance, and to overcome the lack of certain nutrients for specific reasons such as vegetarianism and female athletes during their menstrual cycle (Sekulic et al, 2019; Hoffman et al, 2014; Eraslian & Ulkar, 2015; Pedlar et al, 2018; Rogerson, 2017).

Team sports can be defined as sports in which two or more athletes involve and work together in a common playing area to beat an opposing group of competitors (Fink & Meskiky, 2015). Athletes in team sports had to play their roles in competitions to achieve goals. The workload in team sports consists of a variety of movements such as jumping, acceleration, technical-tactical actions, coordination, and speeds. Therefore, team sports include the high intensity of intermittent exercises (Noutsos, 2015) and present high energy demands (Renard et al, 2021) that required them to take a dietary supplement to support their energy needs and recovery.

The supplementation intake by athletes was often based on unfounded beliefs rather than the content itself (Garthe & Maughan, 2018). In the previous study by Mustafa et al., (2017), university athletes just consume supplements without knowing the importance of before training, after training, during, and after the game. Subgroups of university athletes had a higher risk to use supplements that may harm their health and eligibility (Sassone et al, 2019). Meanwhile, Balaravi et al, (2017) found that most national athletes' knowledge was still limited since most of them claim to take dietary supplements as energy boosters, however, the content does not match the description. Dietary supplements may be necessary at certain periods of life since some athletes encounter dietary challenges such as a vegan or specific medical condition (Garthe & Maughan, 2017). Moreover, based to Sousa et al, (2016) athletes who did not use dietary supplements tend to have inadequacy of several nutrients. Thus, the study of dietary supplement consumption among these groups needs to be conducted as there was much information regarding supplementation in the athletes of Western countries however insufficient among Malaysian athletes (Keat et al, 2017), and this study aimed to determine the dietary supplement consumption between the female university and national team sports athletes.

METHOD

The sampling technique for this study was the non-probability purposive sampling technique. The participants consisted of current female university athletes from Universiti Teknologi Mara (UiTM) and current Malaysian national female athletes who were involved in team sports which were netball, rugby 7's, and hockey. The age range was 18 to 30 years old. There were 45 university athletes (N = 45) which were netball (n = 12), rugby 7's (n=15) and hockey (n=18). So referring to Krejcie and Morgan's table (1970), the population number was 45 and the sample size was 40 (n=40). Next, there were 44 national athletes (N = 44) which were netball (n = 12), rugby 7's (n = 14) and hockey (n = 18). Hence, based on the Krejcie and Morgan table (1970), the population number was rounded up to 45 and the sample size was 40 (n=40). Therefore, the total sample size for this study was 80.

The questionnaire for this study was similar to the version administered to a sample of 5 US universities (Caldwell et. al, 2018; Austin et. al, 2016) and was based on an initial Army survey conducted before the student survey (Caldwell et. al, 2018; Lieberman et. al, 2010; Lieberman et. al, 2012). This questionnaire contains 40 questions in the original version however only 24 questions were selected in this study to fulfill the objectives.

The questions included in this study were key to sociodemographic and lifestyle factors. There were age, height, weight, race/ethnicity, type of sports, level of competition, level of competition, their overall fitness, and their use of tobacco products. Next, this questionnaire also involved the use of dietary supplements on specific supplements used, frequency of use, and reason for use. The questionnaire also assessed reasons that respondents report using each supplement via a list that includes performance enhancement, general health, promoting energy, weight loss, increasing endurance, improving muscle strength, and unsure. Moreover, the questionnaire also includes questions on how confident the respondents were with the supplements, side effects while consuming supplements, who and how the source information of dietary supplements, where they purchase and the reason they avoid using a supplement.

The collection of data was engaged once the ethics had been approved by the Faculty of Sports Science and Recreation and Research Ethics Committee Universiti Teknologi MARA (UiTM) Shah Alam. Next, the participants were chosen based on the criteria of this study. The questionnaire was distributed online via a Google form. Before answering the questionnaire, the participants were required to tick agree as they were voluntary for answering the questionnaire. The time estimated to answer the questions was 15 minutes. Participants were required to answer all the questions, and submit their answers once they finished.

Statistical Package for Social Science (SPSS) software version 26 was used to analyze the data. The significance was set at ($p < 0.05$). For sociodemographic data, and determination of dietary supplements intake, descriptive statistics were to determine the mean, standard deviation, and percentage. An Independent t-test was conducted to determine the significant differences in the means of continuous data between the national athletes and university athletes' group.

RESULT AND DISCUSSION

Table 1. Mean ± Std. Deviation for University and National Athletes

	University athletes (Mean ± SD)	**National athletes (Mean ± SD)**
Height	159.05 ± 6.70	162.71 ± 7.78
Weight	58.10 ± 10.73	60.21 ± 10.19

Table 1 showed the mean height and weight of the participants in this study (N=63). The mean height for university athletes was 159.05 + 6.70 however for national athletes was 162.71 ± 7.78. After that, the mean weight for university athletes was 58.10 + 10.73 and for national athletes was 60.21 ± 10.19. In this study, female national athletes were had heavier weights and taller than university athletes.

Table 2. Frequency and percentage of socio-demographic characteristics

	University athletes n (%)	**National athletes n (%)**
Age		
18-20 years old	4 (10.3)	4 (16.7)
21-23 years old	27 (69.2)	9 (37.5)
24-26 years old	8 (20.5)	2 (8.3)
27-30 years old	0 (0)	9 (37.5)
Race		
Malay	37 (94.9)	17 (70.8)
Chinese	0 (0)	1 (4.2)
Indian	1 (2.6)	0 (0)
Kadazan	1 (2.6)	2 (8.3)
Iban	0 (0)	2 (8.3)
Dusun	0 (0)	2 (8.3)
Education		
SPM	0 (0)	4 (16.7)
STPM/Matric/ Foundation/Diploma	11 (28.2)	4 (16.7)
Degree	28 (71.8)	15 (62.5)
Master	0 (0)	1 (4.2)
Profession		
Full time student	39 (100)	8 (33.3)
Full time athletes	0 (0)	4 (16.7)
Government sector	0 (0)	3 (12.5)

Private sector	0 (0)	5 (20.8)
Full time student-athlete	0 (0)	4 (16.7)
Type of sports		
Netball	13 (33.3)	6 (25)
Hockey	15 (38.5)	9 (37.5)
Rugby 7's	11 (28.2)	9 (37.5)
Level of competition		
University	39 (100)	0 (0)
National	0 (0)	24 (100)
Health status		
Excellent	15 (38.5)	7 (29.2)
Good	24 (61.5)	16 (66.7)
Fair	0 (0)	1 (4.2)
Eating habits		
Excellent	4 (10.3)	4 (16.7)
Good	20 (51.3)	16 (66.7)
Fair	13 (33.3)	4 (16.7)
Poor	2 (5.1)	0 (0)
Usage of tobacco products		
Never used	37 (94.9)	20 (83.3)
Used but quit	1 (2.6)	2 (8.3)
Used 3 or less times per week	1 (2.6)	0 (0)
Used 4-6 times per week	0 (0)	1 (4.2)
Used at least one time	0 (0)	1 (4.2)
Fitness level		
Excellent	2 (5.1)	3 (12.5)
Good	25 (64.1)	18 (75)
Fair	10 (25.6)	2 (8.3)
Poor	2 (5.1)	1 (4.2)

Table 2 above showed the socio-demographic characteristics of the participants. There were 63 participants in this study. The majority age range for university athletes was 21-23 years old (69.9%) meanwhile for national athletes was 21-23 years old and 27-30 years old (37.5%). Next, there were 38.1% (n=24) played hockey, 31.7% (n=20) played rugby 7's and 30.2% (n=19) played netball. In addition, the majority of the participants were university athletes 61.9% meanwhile 38.1% were national athletes. Most of the respondents were "Good" 63.5% meanwhile 34.9% were "Excellent" while 1.6% were "Fair". With regard to eating habits, 57.1 % were "Good", 27% were while 3.2% considered "Poor. "Next, for the fitness level, 68.3% of participants were "Good", 19% were considered "Fair", 7.9% were"Excellent" and 8% were "Poor."

Table 3. Frequency and percentage of dietary supplement consumption in university and national athletes

Frequency and percentage – n (%)										
Type of supplements	**Never**		**Once a month**		**Once a week**		**Few times/week (2-6x)**		**Daily**	
Individual vitamins/minerals	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**
Vitamin A	24	17	2	3	6	2	7	2	0	0
	(61.5)	(70.8)	(5.1)	(12.5)	(15.4)	(8.3)	(17.9)	(8.3)	(0)	(0)
Vitamin C	6	0	5	4	3	7	14	7	11	6
	(15.4)	(0)	(12.8)	(16.7)	(7.7)	(29.2)	(35.9)	(29.2)	(28.2)	(25)
B-Complex supplement	29	21	1	1	3	0	4	1	2	1
	(74.4)	(87.5)	(2.6)	(4.2)	(7.7)	(0)	(10.3)	(4.2)	(5.1)	(4.2)
Calcium	17	8	4	2	8	6	7	5	3	3
	(43.6)	(33.3)	(10.3)	(8.3)	(20.5)	(25)	(17.9)	(20.8)	(7.7)	(12.5)
Folate (Folic acid, Folacin)	28	21	5	1	2	1	1	1	3	0
	(71.8)	(87.5)	(12.8)	(4.2)	(5.1)	(4.2)	(2.6)	(4.2)	(7.7)	(0)
Iron	28	20	5	0	3	2	2	2	1	0
	(71.8)	(83.3)	(12.8)	(0)	(7.7)	(8.3)	(5.1)	(8.3)	(2.6)	(0)
Zinc	29	19	6	1	2	2	2	2	0	0
	(74.4)	(79.2)	(15.4)	(4.2)	(5.1)	(8.3)	(5.1)	(8.3)	(0)	(0)
Protein and other related supplements										
Protein powder	22	6	7	6	3	3	6	7	1	2
	(56.4)	(25)	(17.9)	(25)	(12.5)	(12.5)	(15.4)	(29.2)	(2.6)	(8.3)
Creatine - alone	33	17	4	0	1	1	0	6	1	0
	(84.6)	(70.8)	(10.3)	(0)	(2.6)	(4.2)	(0)	(25)	(2.6)	(0)
Glutamine - alone	34	19	4	1	0	1	0	3	1	0
	(87.2)	(79.2)	(10.3)	(4.2)	(0)	(4.2)	(0)	(12.5)	(2.6)	(0)
Other supplements and sports aid										
BCAA	39	22	1	1	1	0	0	1	0	0
(Branch chain AA)	(94.9)	(91.7)	(2.6)	(4.2)	(2.6)	(0)	(0)	(4.2)	(0)	(0)
Caffeine	14	9	5	2	12	6	4	4	4	3
	(35.9)	(37.5)	(12.8)	(8.3)	(38.8)	(25)	(10.3)	(16.7)	(10.3)	(12.5)
CoQ 10	35	23	3	1	0	0	1	0	0	0
(CoEnzyme Q10)	(89.7)	(95.8)	(7.7)	(4.2)	(0)	(0)	(2.6)	(0)	(0)	(0)
Fish oil/Omega 3	24	9	7	6	6	4	2	4	0	1
	(61.5)	(37.5)	(17.9)	(25)	(15.4)	(16.7)	(5.1)	(16.7)	(0)	(4.2)
Ginseng	36	23	2	0	0	1	0	0	1	0
	(92.3)	(95.8)	(5.1)	(0)	(0)	(4.2)	(0)	(0)	(2.6)	(0)
Sports drink (Gatorade, 100 plus)	5	4	14	1	8	3	10	14	2	2
	(12.8)	(16.7)	(35.9)	(4.2)	(20.5)	(12.5)	(25.6)	(58.3)	(5.1)	(8.3)

* UA – University athletes
* NA – National athletes

Table 3 showed the frequency and percentage of usage in dietary supplement consumption in female university and national athletes. There was better consumption of Vitamin C for both groups. There was 35.9 % of university athletes consumed for few times per week (2-6x) meanwhile 29.2% of national athletes for once a week and a few times per week (2-6x). Next, for protein and other related supplements, there was better consumption of protein powder. There were 17.9% of university athletes, in once a month meanwhile 29.2% of national athletes in few times per week (2-6x). Lastly, for other supplements and sports aid, there was better consumption of sports drinks. In university athletes, there was 35.9% for once a month meanwhile 58.3% of national athletes on few times per week (2-6x).

Table 4. Reason for use of dietary supplements in frequency and percentage

	Frequency and percentage – n (%)													
Type of supplements	**Performance enhancer**		**Promote general health**		**Energy booster**		**Improve endurance**		**Weight loss**		**Greater muscle strength**		**Not sure**	
Individual vitamins/minerals	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**	**UA**	**NA**
Vitamin A	3 (7.7)	0 (0)	3 (7.7)	4 (16.7)	3 (7.7)	1 (4.2)	1 (2.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	29 (74.4)	19 (79.2)
Vitamin C	0 (0)	0 (0)	28 (71.8)	20 (83.3)	5 (12.8)	3 (12.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4.2)	6 (15.4)	0 (0)
B-Complex supplement	2 (5.1)	0 (0)	3 (7.7)	2 (8.3)	0 (0)	0 (0)	0 (0)	0 (0)	2 (5.1)	0 (0)	1 (2.6)	0 (0)	31 (79.5)	22 (91.7)
Calcium	2 (5.1)	1 (4.2)	11 (28.2)	10 (41.7)	1 (2.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (10.3)	4 (16.7)	21 (53.8)	9 (37.5)
Folate (Folicacid, Folacin)	1 (2.6)	0 (0)	7 (17.9)	1 (4.2)	0 (0)	0 (0)	2 (5.1)	0 (0)	0 (0)	0 (0)	1 (2.6)	1 (4.2)	28 (71.8)	22 (91.7)
Iron	0 (0)	0 (0)	7 (17.9)	1 (4.2)	1 (2.6)	3 (7.7)	2 (5.1)	0 (0)	0 (0)	0 (0)	3 (7.7)	2 (8.3)	26 (66.7)	21 (87.5)
Zinc	0 (0)	0 (0)	4 (10.3)	2 (8.3)	3 (7.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (8.3)	32 (82.1)	20 (83.3)
Protein and other related supplements														
Protein powder	5 (12.8)	5 (20.8)	3 (7.7)	1 (4.2)	2 (5.1)	2 (8.3)	0 (0)	1 (4.2)	0 (0)	2 (8.3)	7 (17.9)	7 (29.2)	22 (56.4)	6 (25)
Creatine - alone	1 (2.6)	1 (4.2)	0 (0)	2 (8.3)	1 (2.6)	1 (4.2)	1 (2.6)	0 (0)	1 (2.6)	0 (0)	0 (0)	3 (12.5)	35 (89.7)	17 (70.8)
Glutamine - alone	1 (2.6)	1 (4.2)	1 (2.6)	2 (8.3)	1 (2.6)	1 (4.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	36 (92.3)	20 (83.3)

Other supplements and sports aid														
BCAA (Branched-chain AA)	0 (0)	1 (4.2)	0 (0)	0 (0)	1 (2.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4.2)	38 (97.4)	22 (91.7)
Caffeine	1 (2.6)	2 (8.3)	1 (2.6)	1 (4.2)	21 (53.8)	13 (54.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16 (41)	8 (33.3)
CoQ 10 (CoEnzyme Q10)	0 (0)	1 (4.2)	2 (5.1)	1 (4.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	37 (94.9)	22 (91.7)
Fish oil/Omega 3	0 (0)	1 (4.2)	12 (30.8)	11 (45.8)	0 (0)	0 (0)	1 (2.6)	1 (4.2)	2 (5.1)	0 (0)	1 (2.6)	0 (0)	23 (59)	11 (45.8)
Ginseng	0 (0)	1 (4.2)	2 (5.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.6)	0 (0)	36 (92.3)	23 (95.8)
Sports drink (Gatorade, 100 plus)	10 (25.6)	8 (33.3)	2 (5.1)	1 (4.2)	18 (46.2)	11 (45.8)	4 (10.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (12.8)	4 (16.7)

UA – University athletes

* NA – National athletes

Table 4 showed the reason for dietary supplements used by female university and national athletes in frequency and percentage. The participants had reason to use the supplements. Most of them would use individual vitamins/minerals to promote general health. Next, for protein and other related supplements, both groups consumed as performance enhancers, promote general and greater muscle strength. However, there were some of them used protein and other related supplements as an energy boosters and weight loss. The participants that do not consume the supplements will answer as “Not sure”.

Inferential Statistics

Table 5. Independent Sample T-test (Usage of individual vitamins/minerals)

Individual vitamins/minerals	University athletes (Mean ± SD)	National athletes (Mean ± SD)	t	df	*p*-value
Vitamin A	1.90 ± 1.23)	1.54 ± 0.98	1.201	61	0.234
Vitamin C	3.49 ± 1.43	3.63 ± 1.06	-0.408	61	0.685
B-Complex supplement	1.69 ± 1.30	1.33 ± 1.01	1.168	61	0.247
Calcium	2.36 ± 1.41	2.71 ± 1.46	-0.945	61	0.349
Folate (Folate acid, Folacin)	1.62 ± 1.21	1.25 ± 0.74	1.337	61	0.186
Iron	1.54 ± 1.02	1.42 ± 0.98	0.467	61	0.642
Zinc	1.41 ± 0.82	1.46 ± 0.98	-0.210	61	0.834

Significant: *p-value* <0.05*

An independent t-test was conducted to compare the usage of individual vitamins/minerals for female university and national team sports athletes. Based on table 5 above, there was no significant difference between female university and national team sports athletes in the usage of individual vitamins/minerals. Hence, the null hypothesis was accepted.

Table 6. Independent Sample T-test (Usage of protein and other related supplements)

Protein and Other related supplements	University athletes (Mean ± SD)	National athletes (Mean ± SD)	t	df	*p* value
Protein powder	1.90 ± 1.23	2.71 ± 1.37	-2.435	61	0.018*
Creatine- alone	1.26 ± 0.75	1.83 ± **1**.34)	-2.192	61	0.032*
Glutamine- alone	1.21 ± 0.70	1.50 ± 1.06	-1.333	61	0.188

Significant: *p* value <0.05*

Table 6 showed, there was a significant difference in protein powder (t = -2.435, df = 61, *p* <0.018) between the university and national team sports athletes. Thus, the null hypothesis failed to reject. In addition, there was a significant difference in creatine – alone, (t = -2.192, df = 61, *p* <0.032) between the female university and national team sports athletes. Hence, the null hypothesis failed to reject. However, there was no significant difference for glutamine – alone (t = -1.333, df = 61, *p* <0.188) as the p-value was higher than 0.05. Thus, the null hypothesis was accepted.

Table 7. Independent Sample T-test (Usage of Other Supplements and Sports Aid)

Other supplements and sports aid	University athletes (Mean ± SD)	National athletes (Mean ± SD)	t	df	*p* value
BCAA (branch chain AA)	1.08 ± 0.36	1.17 ± 0.64	-0.719	61	0.475
Caffeine	2.46 ± 1.53	2.58 ± 1.47	-0.335	61	0.738
CoQ 10 (CoEnzyme Q10)	1.15 ± 0.54	1.04 ± 0.20	0.973	61	0.334
Fish Oil / Omega 3	1.77 ± 1.27	2.25 ± 1.26	-1.466	61	0.032*

Ginseng	1.15 ± 0.67	1.08 ± 0.41	.0.464	61	0.644
Sports Drinks (Gatarode, 100 plus)	2.74 ± 1.14	3.38 ± 1.23	-2.061	61	0.440

Significant: *p*-value <0.05*

Table 7. showed there was a significant difference in fish oil usage ($t = -1.466$, $df = 61$, $p < 0.032$) between the university and national athletes. Thus, the null hypothesis failed to reject. However, there was no significant difference in other supplements as the p-value was higher than 0.05. Thus, the null hypothesis was accepted.

The mean height and standard deviation of national athletes in this study were higher than university athletes. It was because national athletes were selected due to their special criteria which were higher in height as it could help them to perform the tasks in their sports. As national athletes compete at a higher level with other athletes from different countries, the selection of athletes must have specific anthropometric characteristics that could fulfill the requirement of related sports. The weight of national athletes was heavier than university athletes. The national athletes were taller compared to university athletes. The greater the physical characteristics of the national female team sport athletes is beneficial for their sports performance.

In this study, there was no significant difference in the usage of individual vitamins/minerals. This may be due to the main reason for usage as to improve health benefits. There was a previous study among Canadian athletes in which the intake of individual or combinations of vitamins and minerals was associated with health-related reasons (Parnell et al., 2015). Moreover, most of the athletes practiced vitamins primarily to prevent illness during competition and to stay healthy (Aljaloud & Salam, 2013; Azizi et al., 2012). However, based on the frequency of use, vitamin C consumption was the highest among the participants, this is similar to the previous study which found that vitamin C supplementation was among the five most commonly used by athletes (Sekulic et al., 2019) and Keat et al., (2017) stated approximately 27% of the national athletes in the study consumed vitamins and minerals with the most popular being vitamin C. Barrack et al., (2020) also found a higher proportion of female NCAA Division I athletes in Canada University that consumed vitamin C. Vitamin C has been the most popular individual vitamin among athletes all over the world. This might be due to the benefits of vitamin C which are believed to enhance sports performance by obtaining better exercise and reducing oxidative stress (Ayuso et al, 2015).

For minerals, some studies exhibit higher use of calcium supplements in female athletes (Barrack et al, 2020; Kantor et al, 2016; Froiland et al, 2004; Radimer et al, 2004; Krumbach et al, 1999) however there was still low consumption of calcium supplement among this study participants. This could be due to the athletes already practicing calcium in their dietary intake from natural sources and dairy products such as milk, yogurt, and cheese that was highly associated with calcium intake among the athletes (Wrzosek et. al, 2019). However, further investigation is recommended for future research on determining the calcium intake among female athletes as we know that female athlete have a higher risk of female athlete triad.

From this study, there was a significant difference in the usage of protein and other related supplements which were protein powder and creatine. The national athletes showed higher practice in consuming protein powder and creatine for few times per week (2-6x) than university athletes that used for once a month. The involvement of athletes in high-intensity training was more likely to consume protein powder and creatine (Baltazar-Martin et al., 2019) to sustain longer during training or competition. For the participants in this study, national athletes had longer training time and training load compared to university athletes, thus the requirement of their protein intake is higher.

This study found a significant difference in the usage of fish oil/omega 3 for other supplements and sports aid categories. There was a higher consumption of fish oil among national athletes than among university athletes. Between the two groups of participants, the national athletes were competing professionally at the national or international level and represented their country (Knapik et al, 2016), they were also training and competing in high-performance programs organized by different sports federations (Navarro et al, 2020). Thus,

the intake of fish oil among the female team sports national athletes group has the benefits of enhancement in endurance capacity and delayed onset of muscle soreness, and it is known for the good of enhanced recovery and immune system. The national athletes required high energy demand and recovery from any injuries. Hence, the practice of fish oil/omega-3 supplements could improve energy availability (Angelo, 2020) and promote recovery (Philpott et. al, 2018).

Lastly, for sports drink consumption, surprisingly there was no significant difference between the groups and the sports drink intake was not that frequent for both groups in this study. This is contrary to the study by Keat et. al (2017), as sports drinks were the most popular among athletes. Although sports drink is one of the most effective supplements in enhancing sports performance, but the participants in this study might have a lack of knowledge of the roles and importance of sports drinks as fluid replacements during exercise, especially during high-intensity training and competition. Razalee at al., (2015) found a lower percentage of participants (66.3%) who knew that sports drinks should be taken during training with a duration of more than one hour.

CONCLUSION

In conclusion, the female university and national athletes have consumed at least one dietary supplement in their daily life. The reason for taking the supplements was not only to enhance their sports performances but for maintaining their health status, promote recovery and improve their nutritional strategies too. There was a higher dietary ssupplement consumption among female national athletes compared to university athletes. These were because most national athletes compete at a higher level of competition, training for a longer time, and required high energy demands that could slightly increase the requirements of certain vitamins/minerals. Contain conclusions and recommendations. Findings from this research suggest that education on dietary supplement consumption is necessary to be given to the group of athletes to enhance their knowledge of the benefit and usage of dietary supplements that could enhance their sports performance. Future research could include the determination of dietary supplement consumption together with the dietary intake to get a better understanding of the usage of dietary supplements among athletes due to insufficient dietary intake or other factors.

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