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COMPARISON OF NUTRITIONAL STATUS AND DIETARY HABITS AMONG STUDENT ATHLETES AND NON-STUDENT ATHLETES OF UiTM

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ABSTRACT

The purpose of this study was to compare nutritional status and dietary habits among student athletes and non-student athletes of UiTM as well to study the relationship between the body mass index (BMI), dietary habits and nutritional status. An online questionnaire was used to collect data of respondents. Dietary habits questionnaire was modified from Marino (2001) which comprised 18 questions. Nutrition knowledge questionnaire was modified from Paugh (2005) which comprised of 29 questions. There was a significant difference in total dietary habits score between student athletes and non-student athletes, t (198) = -3.145, p = 0.002 meanwhile, there was no significant difference in total nutrition knowledge score between student athletes and non-student athletes, t(198)=0.334, p=0.433. Null hypothesis accepted for both student athletes and non-student athletes, showing that their BMI did not have significant relationship with their dietary habits and nutrition knowledge. The mean dietary habits score of student athletes were higher than non-student athletes, so there was a significant difference in total dietary habits score between two groups. Meanwhile, there was no huge difference between the mean score for nutrition knowledge between student athletes and non-student athletes. There was no significant difference in total nutrition knowledge score between the two groups.

***Keyword**: dietary habits, body mass index, students athletes, non- students athletes, nutritional knowledge.*

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INTRODUCTION

Nutrition education is one of the crucial aspects of nutrition knowledge whereby it plays an important role in raising awareness with the aim to improve the health of community Harvey-Berino, Hood et al. (1997). Lacking knowledge regarding nutrition contributes to the worldwide burden of diseases such as Type-2 Diabetes Mellitus, obesity and cardiovascular diseases has called for a more stringent approach to nutrition education. Educating individuals with nutrition related knowledge would lead them to make a better dietary option leading to a more reformed, food-conscious society (Barzegari, Ebrahimi et al. 2011).

In the community, a report has shown that there is a close relationship between nutritional knowledge and dietary intake, as the former seems to be a factor influencing the latter (Leonard, Chalmers et al. 2014). In fact, the correlation between these two factors are directly proportional to each other as the better the individual's nutritional knowledge, the better the diet quality. However, this information is relatively unexplored in athletes (Heaney, O'Connor et al. 2011). In a recent systematic review by Heaney and colleagues stated that various studies use poor-quality and unreliable tools to assess nutritional knowledge among athletes.

Sports nutrition is characterized as the use of nutritional information to be used in day-to-day dietary preparation to provide energy for vigorous physical activity, to repair tissue in the body after injury, to improve sports performance in tournaments and to ensure good health and well-being (Contento 2007). Athletes must ensure adequate and healthy nutrition in relation to preserving optimum body structure, mental and physical health in order to reach their peak athletic success (Galanti, Stefani et al. 2015). However, rigorous training may have a negative impact on the nutritional status of rising athletes if their dietary intake does not meet the increased dietary requirements of exercise (Coutinho, Porto et al. 2016).

Athletes understanding and information on selection of consumption of food at the right time is essential as certain food are better consumed at a certain time (Kreider, Wilborn et al. 2010). Most athletes, however, are poor in making decision to choose an appropriate daily

nutritional choice with sport nutrition specifications and they are uneducated about sound nutritional practices (Abood, Black et al. 2004); (Nichols, Jonnalagadda et al. 2005); (Zawila, Steib et al. 2003). Studies have shown that performance can be promoted in liquid form even with a carbohydrate rinse lasting for about one hour. Athletes should seek an adequate fluid intake before any training or competition, as well as during and after the training. Consuming the fluid long enough is important so that the body is hydrated to achieve optimal absorption, along with excretion of excess urinary fluid through the kidney. Athletes are not born but are trained, so athletes' workout and training process depends primarily on these nutritional statuses and their knowledge of scientific nutrition to maintain the required physique and improve physical performance.

Dietary Intake

A balanced diet is crucial to maintain a good supply of nutrients in the body and reduce risk of major diseases. The Malaysian Dietary Guidelines 1999, (Norimah, Hwong et al. 2010) suggested three vital recommendations when preparing healthy meals, eating a balanced diet, consume a wide option of foods and consumption of foods in average. These recommendations have also been suggested by other Dietary Guidelines from various developed countries such as USA (Health and Services 2005), Australia (NHMRC 2003) and Singapore (Singapore 2003).

According to journal Sedek and Yih (2014) dietary habits mean score of non-student athletes was significantly greater than student athletes by (2.0 ± 1.5). The results from the present study were not similar from the study by Cavadini, Decarli et al. (2000) which showed that athletic adults displayed healthier dietary habits than non-athletic adults with female student athletes mean scores was greater than male student athletes. However, there was no significant difference in the mean scores of dietary habits score of female student athletes to be significantly greater than male student athletes found in any study.

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There is a systematic review which compiled the data from 29 peer-reviewed journals by Heaney, O'Connor et al. (2011). Their results show that university athletes report similar but slightly better nutrition knowledge than non-athletes (5 out of 7 studies) and information may be more in females as compared to males. A survey study by Rosenbloom, Jonnalagadda et al. (2002) on 328 more established student athletes also found that there was a high level of misconception regarding nutrition information as well as both male and female student athletes had low nutrition knowledge. Knowledge was assessed in 328 respondents (237 men, 91 women) via a nutrition questionnaire. The average score was up to 53% correct-response rate. On the other hand, there is a study proven which found a same score of 56.4% by Weeden, Olsen et al. (2014).

METHODOLOGY

Population

The sampling technique used in this research was purposive sampling which was non-probability sampling. The target population is student athletes and non-student athletes from UiTM. The criteria are male and female age range between 19 to 26 years old. The student athletes must at least participate for KARISMA level.

Instrumentations

Anthropometric measurements as height and weight. Based on these measurements, should have determined the body mass index (BMI) by using formula: Weight (kg) / height2 (m). BMI of respondents were categorized based on World Health Organization (2000), included underweight (less than 18.5 kg/m^2), normal weight (18.5 – 24.9 kg/m^2), overweight (25.0 – 29.9 kg/m^2) and obese (greater than 30 kg/m^2).

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An online questionnaire was used to gather data from respondents for this study to be carried out. Respondents' demographic information including gender, age, academic background is critical to assessment. In addition , the questionnaire was also used to evaluate the sports types for student athletes and the previous nutrition education. Dietary habits questionnaire was modified from Marino (2001), which comprised 18 questions, including the frequency of food intake from every section of the food pyramid, snack, fast food, vitamin and mineral supplements, breakfast, beverages intake and meal skipping. The answers for this section were 'always' (4), 'often' (3), 'sometimes' (2) and 'never' (1). The greater the scores given, the better the dietary habits of the respondents. Nutrition knowledge questionnaire was modified from Paugh (2005)which comprised of 29 questions. The respondents were asked to choose an answer according to the level of agreement towards all questions. The choices are inclusive with these answers such as 'strongly agree' (4), 'agree' (3), 'disagree' (2) and 'strongly disagree' (1). Nutrition knowledge was classified as 'very good' (85-100), 'good' (70-84), 'moderate' (55-69) and 'weak' (<54). The source of their nutritional knowledge was also crucial for respondents to answer whether they were gaining information from advertisements, experts, or other sources in the questionnaire.

DATA ANALYSIS AND RESULTS

All data collection analysed by using Statistical Package for Social Sciences (SPSS) 20.0 (SPSS Inc., Chicago, IL). Other than that, different type of tests used such as descriptive test, Independent T-Test, Chi Square test and Pearson Correlation Test. Descriptive statistics awere used as mean and standard deviation (SD) and percentage for all variables. The significance level is set at $p<0.05$ for all types of analysis.

Table 1: Demographic Characteristics of Respondents

Demographic Profile	No. of Respondents (n=200)	Percentage (%)
Gender		
Male	48	24.0
Female	152	76.0

Age (Years)		
19	21	10.5
20	7	3.5
21	14	7.0
22	35	17.5
23	61	30.5
24	49	24.5
25	23	6.5
Category		
Male Student athletes	22	11.0
Male Non-Student athletes	26	13.0
Female Student athletes	78	39.0
Female Non-Student athletes	74	37.0
Types of sports of Student athletes (n=100)		
Archery	2	1.0
Badminton	2	1.0
Basketball	4	2.0
Basketball, Handball	1	0.5
Basketball, Netball	3	1.5
Basketball, Netball, Squash	1	0.5
Basketball, Swimming	1	0.5
Bowling	4	2.0
Cycling	2	1.0
Fencing	2	1.0
Football	6	3.0
Futsal	6	3.0
Futsal, Football	1	0.5
Golf	1	0.5
Handball	10	5.0
Handball, Futsal	2	1.0
Handball, Rugby	1	0.5
Handball, Silat	3	1.5
Handball, Silat, Football, Rugby	1	0.5
Handball, Softball	1	0.5
Hockey	5	2.5
Lawn Bowls	2	1.0
Netball	2	1.0
Netball, Handbal	11	5.5
Netball, Silat	1	0.5
Netball, Taekwondo, Rugby	3	1.5
Rowing	1	0.5
Rugby	1	0.5
Sepak Takraw	4	2.0
Silat	4	2.0
Silat, Softball	4	2.0

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Squash	1	0.5
Taekwondo	2	1.0
Tennis	2	1.0
Tenpin Bowling	1	0.5
Track and Field	1	0.5
Track and Field, Table Tennis	3	1.5
Volleyball	1	0.5

Table 1 shows the demographic characteristics of the respondents. Male respondents were 24.0% while female was 76.0%. The highest age of respondent was coming from age 23 years old which was 30.5% and the lowest was from age 20 years old which was 3.5%. There are 4 categories of the respondent which was male student athletes 11.0%, male non-student athletes 13.0%, female student athletes 39.0% and female non-student athletes 37.0%.

Table 2: Physical Characteristic Student athletes and Non-Student Athletes According to Gender

	Mean±SD				
	Male (n = 48)		Female (n = 152)		
Anthropometric Measurement	Student athletes (n = 22)	Non-Student athletes (n = 26)	Student athletes (n = 78)	Non-Student athletes (n = 74)	Total (n = 200)
Weight (kg)	69.08±16.28	72.46±15.24	57.69±9.30	53.59±9.54	59.34±13.05
Height (cm)	172.93±8.30	170.79±5.56	161.26±5.30	159.57±6.67	163.15±7.92
Body Mass Index (kg/m^2)	22.91±3.97	24.71±4.27	22.16±3.29	21.03±3.40	22.15±3.71

*significant difference between groups, p <.05

Anthropometric Characteristics and Frequency of Physical Activity:

Table 2 shows physical characteristic student athletes and non-student athletes according to gender. According to the table, body weight of male non-student athletes was slightly higher (72.46±15.24) than male student athletes (69.08±16.28). However, the height of male student athletes was higher than male non-student athletes (172.93±8.30) and (170.79±5.56). Body mass index for male student athletes was 22.91±3.97 and male non-student athletes 24.71±4.27. For female student athletes, their weight was higher than non-student athletes which was 57.69±9.30 and 53.59±9.54. Female athlete's height was higher (161.26±5.30) compared to non-student athletes which was 159.57±6.67. Body mass index for female student athletes was 22.16±3.29 and female non-student athletes 21.03±3.40.

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Table 3: Classification of BMI According to Gender and Category of Respondents

Classification of BMI (kg/m^2)	Male (n = 48)				Female (n = 152)				Total (n =200)	
	Student athletes (n = 22)		Non-Student athletes (n = 26)		Student athletes (n = 78)		Non-Student athletes (n =74)			
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Underweight (<18.5)	-	-	1	3.8	13	50	12	46.2	26	13
Normal Weight (18.5-24.9)	16	12.1	15	11.4	46	34.9	55	41.7	132	66
Overweight (25.0-29.9)	4	12.9	6	19.4	18	58.1	3	9.7	31	15.5
Obese (>30.0)	2	18.2	4	36.4	1	9.1	4	36.4	11	5.5

Table 3 showed distribution of respondents based on the classification of BMI by gender and category. According to Organization (2000), majority of respondents (66%) had normal weight, 15.5% of respondents were overweight, 13% were underweight and 5.5% obese.

There was 3.8% for male non-athlete that was underweight. For normal weight, there was a slight difference for male student athletes and male non-student athletes which was for male student athletes the percentage was 12% slightly higher than non-student athletes which was 11.4%. Furthermore, for overweight the percentage for male non-student athletes were 19.4% and for male student athletes were 12.9%. Other than that, for obese male non-student athletes were 36.4% higher than male student athletes which was 18.2%.

For underweight category female student athletes were 50% and 46.2% for female non-student athletes. Other than that, for normal weight category, female student athletes are 34.9% which was lower than female non-student athletes, 41.7%. Furthermore, there was huge difference from female student athletes and female non-student athletes in overweight category. Percentage for female student athletes was 58.1% higher than female non-student athletes was 9.7%. Obese female student athletes recorded 9.1% meanwhile obese female non-student athletes were 36.4%.

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Table 4: Frequency Training of Respondent in A Week

Training frequency/week	Student athletes (n = 100)		Non-Student athletes (n = 100)		Total (n = 200)	
	n	%	n	%	n	%
Never	-	-	23	23	23	23
1 time a week	5	5	25	25	30	30
2-3 times a week	60	60	37	37	97	97
4-6 times a week	30	30	14	14	44	44
Everyday	5	5	1	1	6	6

Table 4 shows the frequency of respondents who did training in a week. The highest frequency of physical activity in a week for student athletes and non-student athletes were 2 to 3 times a week which was 60% and 37% respectively. There were 23% non-student athletes who did not exercise during the week. This may be due to busy university life with tight schedule of academic and co-curricular activities.

Table 5: Total Dietary Habits Score of Respondents

Dietary Habits	Student athletes (%)	Non-Student athletes (%)	t	*df*	*p* value
Minimum	43	40	-3.145	198	0.002
Maximum	45	58			
Mean±SD	51.04±4.13	49.32±3.58			
Category					
Moderate (36-53)	75	89			
High (54-72)	25	11			

*significant difference between groups, p <.05

Table 5 shows dietary habits score of respondents. The minimum percentage for student athletes was 43% meanwhile minimum percentage for non-student athletes was 40%. Besides that, the maximum percentage for student athletes were 45%, a little bit lower than non-student athletes which was 58%. The dietary mean score for student athletes was 51.04±4.13 while for non-student athletes was 49.32±3.58. The dietary mean score for student athletes was higher than non-student athletes, therefore there is a significant difference in total dietary habit score between the two groups of student athletes and non-student athletes at 0.05 level of significant t(198) = -3.145, p = 0.002. Most of the respondents in both groups were in moderate category.

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There was 25% in high category for student athletes meanwhile for non-student athletes were 11%.

Table 6: Total Nutritional Knowledge Score of Respondents

Nutritional Knowledge	Student athletes (%)	Non-student athletes (%)	t	*df*	*p* value
Minimum	68	55	0.334	198	0.433
Maximum	100	97			
Mean ± SD	82.46±5.83	81.07±7.40			
Category					
Moderate (55-69)	2	4			
Good (70-84)	66	69			
Very Good (85-100)	32	27			

*significant difference between groups, p <.05

Table 6 shows total nutrition knowledge score of respondents. The minimum percentage for student athletes was 68% meanwhile minimum percentage for non-student athletes was 55%. Besides that, the maximum percentage for student athletes were 100% compared to non-student athletes which was 97%. The nutrition knowledge mean score for student athletes was 82.46±5.83 while for non-student athletes was 81.70±7.40. There was no huge difference between the mean score of student athletes and non-student athletes, the independent t-test statistics analysis showed there is no significant difference in total nutrition knowledge score between the two groups of student athletes and non-student athletes at 0.05 level of significant t(198) = 0.334, p = 0.433. Most of the respondents in both groups were in good category. There was only 2% for moderate category of student athletes while 4% for non-student athletes. Other than that, 32% of student athletes were in very good category meanwhile for non-student athletes 27%.

Table 7: Relationship between BMI, Dietary Habits and Nutrition Knowledge of Student athletes.

Parameters	BMI (kg/m^2)	Dietary Habits	Nutritional Knowledge
BMI	1.000	-0.093	-0.036
Dietary Habits		1.000	-0.022
Nutrition Knowledge			1.000

Table 7 shows the relationship between BMI, dietary habit, and nutrition knowledge of student athletes. The Pearson correlation statistics analysis showed that, for the relationship

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between BMI and dietary habits, the r - value is – 0.093, and the sig-r is 0.359, since the sig-r is > 0.05, null hypothesis is accepted showing that BMI of student athletes did not have significant relationship with their dietary habits. For the association between BMI and nutrition knowledge, the r - value is -0.036 and the sig-r is 0.723, since the sig-r is > 0.05, null hypothesis is accepted showing that BMI of student athletes did not have significant relationship with their nutrition knowledge. For the relationship between dietary habits and nutritional knowledge, the r - value is -0.022, and the sig-r is 0.827, since the sig-r is > 0.05, null hypothesis is accepted showing that dietary habits of student athletes do not have any significant relationship with their nutritional knowledge.

Table 8: Relationship between BMI, Dietary Habits and Nutrition Knowledge of Non-Student Athletes

Parameters	BMI (kg/m^2)	Dietary Habits	Nutritional Knowledge
BMI	1.000	0.037	0.045
Dietary Habits		1.000	0.030
Nutrition Knowledge			1.000

Table 8 shows the relationship between BMI, dietary habit, and nutrition knowledge of non-student athletes. The Pearson correlation statistics analysis showed that, for the relationship between BMI and dietary habits, the r - value is – 0.037, and the sig-r is 0.713, since the sig-r is > 0.05, null hypothesis is accepted showing that BMI of non-student athletes did not have significant relationship with their dietary habits. For the association between BMI and nutrition knowledge, the r - value is 0.045 and the sig-r is 0.657, since the sig-r is > 0.05, null hypothesis is accepted showing that BMI of non-student athletes did not have significant relationship with their nutrition knowledge. For the relationship between dietary habits and nutritional knowledge, the r - value is 0.030, and the sig-r is 0.765, since the sig-r is > 0.05, null hypothesis was accepted showing that dietary habits of non-student athletes do not have any significant relationship with their nutritional knowledge.

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DISCUSSION

Demographic Data

The result revealed that the highest percentage of 30.5% came from age of 23 years old and the lowest came from age of 20 years old which was 3.5%. There were four groups of respondents which was male student athletes 11%, male non-student athletes 13%, the highest was female student athletes 39% and female non-student athletes 37%.

The outcome showed a marginally higher body weight of male non-student athletes (72.46±15.24) than male student athletes (69.08±16.28), for the physical trait. Male student athletes' height, however, was higher than male non-student athletes (172.93±8.30), and (170.79±5.56). The male student athlete body mass index was 22.91±3.97 lower than the male non-college athletes 24.71±4.27. Nevertheless, their weight was higher for female student athletes than for non-student athletes which was 57.69±9.30 and 53.59±9.54. The height of the female student athlete was higher (161.26±5.30) compared with the 159.57±6.67 non-student athletes. The body mass index was 22.16±3.29 higher for female student athletes than the female non-student athletes 21.03±3.40. Such results differed from those of Ode, Pivarnik et al. (2007), who stated that male and female student athletes had higher body weight , height, and BMI than male and female non-student athletes.

Depending on the gender and category classification of BMI, the result revealed that there was a small disparity between male student athletes and male non-student athletes which was 12% marginally higher for male student athletes than 11.4% for non-student athletes. Nevertheless, there was a big gap for the overweight and obese category between male student athletes and male non-student athletes, which is higher for the overweight category than male non-student athletes, 19.4% and 12.9%. Female non-student athletes were 36.4% higher than male athletes for obese athletes, which was 18.2%. The results for female respondents showed that female student athletes are 34.9% lower than female non-student athletes for the average weight group, 41.7%. In fact, there was a significant gap between female student athletes and female non-student athletes in the overweight category, where the rate for female student

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athletes was 58.1 percent higher than 9.7 percent for female non-student athletes. Among obese category, female non-student athletes were 36.4% higher than female student athletes, 9.1%.

The result revealed that for student athletes and non-student athletes the highest level of physical activity in a week was 2-3 times a week which was 60% and 37% respectively. Non-student athletes who did not work out during the week were 23%.

Comparison of Nutritional Knowledge between Student Athletes and Non-Student Athletes.

The result is graded into 4 groups for the very good, strong, moderate, and weak nutritional details. The more the score increases, the higher the nutrition sensitivity. The results of the current study contrasted with results from Heaney, O'Connor et al. (2011) which stated that there was no significant difference in mean score in nutrition knowledge between student athletes and non-student athletes. The results showed that neither student athletes nor non-student athletes were in weak category, and that most respondents were in good categories. This has shown that both groups have a solid foundation of nutritional awareness. Hence the respondents are recommended to attend a nutritional education session to increase the respondents' nutritional knowledge to a very good level.

Relationship between BMI, Dietary Habits and Nutrition Knowledge of Student Athletes and Non-Student Athletes.

There was a lack of nutritional knowledge among student athletes as the findings showed were close to those of Sedek and Yih (2014), that the BMI of student athletes had no substantial connection with their dietary habits and nutritional knowledge. The Pearson correlation statistics study found that the r - value is – 0.093 for the relationship between BMI and dietary habits, and the sig-r is 0.359, because the sig-r is > 0.05, a null hypothesis is agreed that suggests that student athletes' BMI has no meaningful association with their dietary habit. For the correlation between BMI and knowledge of nutrition, the r - value is -0.036 and the sig-r is 0.723, because the sig-r is >0.05, null hypothesis was agreed which indicates that student athletes' BMI had no significant relationship with their knowledge of nutrition. The r - value

for the relationship between dietary habits and nutritional knowledge is -0.022, and the sig-r is 0.827, since the sig-r is > 0.05, it is agreed that null hypothesis indicates that the dietary habits of student athletes have no substantial association with their nutritional awareness.

Among non-student athletes, the same findings as the Sedek and Yih (2014) journal were shown that non-student athlete BMI did not have substantial nutritional awareness and dietary habits. This study of Pearson correlation statistics revealed that the r - value is –0.037 for the relationship between BMI and dietary habits, and the sig-r is 0.713, (p-value for Pearson correlation) because the sig-r is >0.05, null hypothesis is agreed suggesting that non-student athletes' BMI had no substantial association with their dietary habits. For the correlation between BMI and knowledge of nutrition, the r - value is 0.045 and the sig-r is 0.657, because the sig-r is > 0.05, null hypothesis is agreed which indicates that non-student athletes' BMI had no significant relationship with their knowledge of nutrition. For the relationship between dietary habits and nutritional awareness, the r - value is 0.030, and the sig-r is 0.765, because the sig-r is >0.05, it is agreed that null hypothesis indicates that non-student athletes' dietary habits have no important relationship to their nutritional awareness.

CONCLUSION

Understanding student athletes' nutritional awareness and effect on dietary intake was essential to the advancement of nutrition-education initiatives to enhance their dietary intake and athletic results. Inadequate dietary awareness and myths about nutrition may have serious effects on student athletes' success (Ali, Al-Siyabi et al. 2015).

The dietary habits mean score of student athletes were higher than non-student athletes, therefore there was a significant difference in total dietary habits score between two groups. Meanwhile, there was no huge difference between the mean score for nutrition knowledge between student athletes and non-student athletes. There was no significant difference in total nutrition knowledge score between the two groups.

It was discovered that the relationship between BMI, dietary habits and nutrition knowledge of student athletes did not have significant relationship with their dietary habits and the same goes for non-student athletes, there was no significant relationship with their dietary habits and nutrition knowledge.

To enhance dietary intake and nutritional awareness for student athletes and non-student athletes, the implementation of nutrition education workshops and courses is required. For a student athlete, it can help boost their performance while it may help healthier lifestyle for non-student athletes. Hopefully UiTM Sports Centre will use the results of this study as a reference and guidance to prepare for their athletes to develop eating habits, nutritional awareness of student athletes and their sporting success.

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