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FULL PAPER

Carbohydrates intake preference among university students towards balanced intake practice

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Abstract

Food is necessary for our living since it helps in preserving our life in this world. Occasionally, we may have similar food preferences with our friends and families and sometimes we recognize the meals as the highlight for a celebration. Usually, people tend to choose their meals according to the availability of the meal in the market or the characteristics of the food itself such as the taste of the food. Students usually choose food based on their need, but it is vital for them to take care of their daily nutrient intake, especially carbohydrate (CHO) to give them more energy to facilitate productivity and healthy daily life. However, there is a possibility to practice imbalance intake due to surrounding factors that can cause an excessive intake of nutrient which later may contribute to obesity or inadequate intake that may cause lethargic and nutrient deficiency. This study determined the carbohydrate preferences among college students in UiTM Dungun, Terengganu, Malaysia. Data collection was done by convenience sampling from 160 students (bachelor's degree student). A questionnaire that consisted of two sections; section A (socio-demographic profile) and section B (food preferences) was used to collect the data. Majority of the students chose rice (74.4%) as their most preferred carbohydrates, followed by 10.6% noodles, 7.5% bread, 3.8% cereal product, 2.5% biscuits and only 1.3% of the students preferred tubers. This can give some ideas and more room for improvement and monitoring on the CHO intake towards healthy eating practice among university students. This will also help the food provider in preparing and modifying healthy meal according to food preferences at the university's cafeteria. In addition, this may also assist food manufacturer to get some ideas for proposing healthier food innovation in the future based on youth preference.

1. Introduction

Carbohydrate (CHO) consumption can provide energy to our body and it is a fundamental part of the human diet all over the world. Principally, a diet with high consumption of carbohydrates (except sugar) associates with the high nutritional quality of the diet. The sources for carbohydrate include rice, grains, cereal, fruit, vegetables, dairy products as well as the sugar starch and fiber (Mahan *et al*., 2012). It is critical to differentiate carbohydrate and oils or fat since carbohydrate is less calorific.

Das *et al*. (2017) stated that adolescent is where the period of rapid growth occurs. Thus, to accomplish full growth potential among adolescent, sufficient energy and nutrition intake is vital. It is essential to meet the nutritional requirement in sustaining optimal health and to decrease the threat of diseases. Macronutrients such as carbohydrate, fat and protein are required in large amount, as compared to micronutrients that are required only in a very small amount (IPH, 2017). According to the Recommendation Nutrient intake (RNI) for Malaysia 2017, it has recommended that total daily energy intake (TEI) from carbohydrate should be between 50-65%. (NCCFN, 2017). Previously, according to the National

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Health Morbidity survey among adolescent, it showed that 51.5% (95% CI: 48.89, 55.94) of the adolescents has met the recommendation. Only 4.4% (95% CI: 2.97, 5.32) surpassed the limit which consumes more than 65% of the TEI. However, 44.1% (95% CI: 40.00, 47.26) of the adolescents consume carbohydrate below the recommendation limit (<50%) (IPH, 2017).

Food preference develops since before birth and may change as one aged (Hale, 2018). There are several factors contributing to food preference such as physical, biological, society and culture. It differs between people and these factors will affect food preference pattern during breakfast, lunch, hi-tea, dinner and supper (Vabø and Hansen, 2014). Nowadays, students always have a busy schedule and they are the only one responsible for their own health. It is vital for them to take care of their daily nutrient intake, especially carbohydrate to give them more energy to facilitate productivity and healthy daily life. It is vital for them to take care of their daily nutrient intake, especially carbohydrate to give them more energy to facilitate productivity and healthy daily life. However, there is a possibility to practice imbalance intake due to surrounding factors that can cause an excessive intake of nutrient which later may contribute to obesity or inadequate intake that may cause lethargic and nutrient deficiency. They are also exposed to morbidities if they do not take any precaution from this related issue.

In recent times, the improvement in technology and increased healthy eating concern among the society had encouraged the food manufacturers to create wholesome meals related to carbohydrate. Through this approach, it can inspire and encourage society to consume wholesome foods and have a healthy lifestyle. Few studies had been done on innovative bread development due to the increase in obesity problems in society (Blažeková *et al*., 2015). In step with the study, few scholars also developed wholesome food such as food rich in fiber and beta-glucan by adding oat into the sourdough, which will be applied to produce oat bread that is healthier for the weight loss plan. Besides, the fermented oat sourdough can also be used in manufacturing the bakery products instead of evolution for healthy foods only (Blažeková *et al*., 2015).

Currently, few carbohydrate food innovations had been generated in Malaysia, particularly for bread like bran and wheat germ, wholegrain and fine grain whole meal. Wholegrain bread had been one of the revolutionary bread that was made from wholegrain and supply important nutrient for a healthy body. In line with the studies, whole grains are one of the food groups that prevent the possibility of diabetes type 2 disease as well as heart disease (Kyrø *et al*., 2018). Hence, individuals who seek to maintain a healthy body are recommended to consume healthy carbohydrate food sources like wholesome meals as one of the alternatives. Therefore, this study aims to determine carbohydrate preferences among college students in UiTM Dungun, Terengganu. This is important to see one's preference that may help them achieve balance carbohydrate intake and assist food manufacturer to develop some ideas towards more healthy food choices based on youth preference.

2. Materials and methods

This study is a descriptive study involving 160 students who were recruited by convenience sampling from all faculties in Universiti Teknologi MARA (UiTM) Dungun Campus, Terengganu, Malaysia. This study aimed to evaluate the carbohydrate choices among the students who were different in ages, genders and diverse programs such as Bachelor of Finance, Bachelor of Hotel Management and Bachelor of Food Service. For the data collection, a questionnaire was adapted from Food Frequency Questions (FFQ) from National Health and Nutrition Examination Survey, (NHANES) (CDC, NCHS, 2015) as well as from Harvard Food Frequency Questionnaire (HSPH, 2012). The questionnaire was distributed to the participants, consisting section A (socio -demographic profile) and section B (food preferences). The food preferences part compromised the questions regarding food in the carbohydrate groups such as rice, noodles, bread, cereal product, biscuits and tubers. Each group consists of six dimensions questionnaire that needs to be answered by the respondents (i.e., the most preferred food in each type of group, the most preferred way of consumption, the most preferred place to buy food/dishes and the frequency of the food being taken). Section A was multiple-choice questions. Meanwhile, for Section B, there were multiple-choice, short questions and a 'yes' or 'no' questions. All questions are required to be answered by the participants for them to move to another section in this questionnaire. The questionnaire was prepared in multi-language; Malay and English for a better understanding and had been validated in a pilot study. Cronbach's Alpha ranging from 0.62 to 0.70 was reported in the pilot study and was acceptable in the study (Nunnally, 1994). The questionnaire was handed to the focus group of respondents, based on the time and suitability of respondents, which has been arranged beforehand. The instructions of the questionnaire were explained to the respondents and were collected on the same day. Respondents finished answering the question in 15 to 30 minutes. Social package for Social Sciences (SPSS) model version 20.0 was used to analyze the data. Descriptive statistics were carried out to determine the food preferences of the respondents.

3. Results

3.1 Socio-demographic

Figure 1 shows the socio-demographic data of this study. From the result, 160 university students participated in this study with the majority were female (87.5%, n=140) and only 12.5 % (n=20) were male. It was also found that most of the respondents were aged between 18 to 20 years (83.7%, n=134) and followed by respondents aged between 20 to 25 years old with 16.3% (n=26).

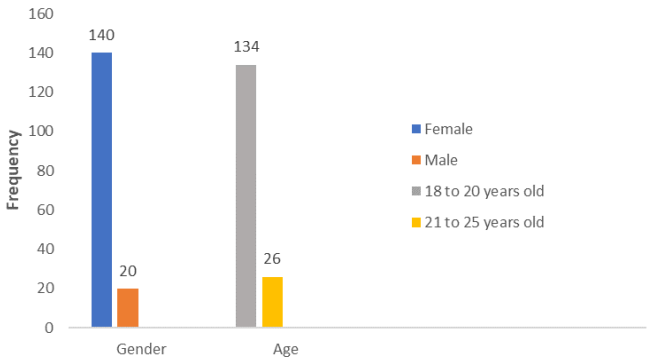

Figure 1. Socio-demographic data of respondent (Frequency)

3.2 Type of carbohydrate preferences among students

Carbohydrate preference among respondents was divided into six groups: rice, noodles, bread, cereal product, biscuits and tubers. In general, rice was the most preferred carbohydrate with a score of 74.4% (n=119) while 10.6% (n=17) of the respondents chose noodles (Figure 2). Meanwhile, bread was the third (7.5%, n=12) most chosen in the carbohydrate group. This study also found that only 3.8% (n=6) respondents chose cereal products while the least chosen carbohydrates were tubers 1.3% (n=2) followed by biscuits 2.5% (n=4). Therefore, this study showed that rice was the most chosen carbohydrates while the least chosen carbohydrates were tubers.

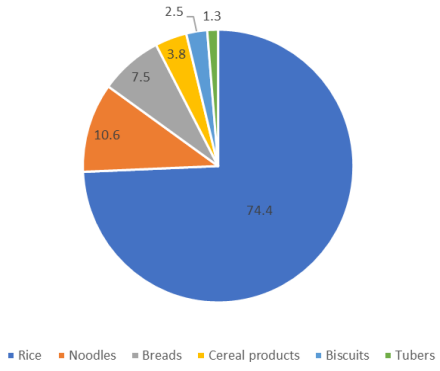

Figure 2. Carbohydrate preference among respondents (%)

3.2.1 Rice

Table 1 shows the frequency and percentage of respondent preferring rice. White rice was the most preferred type of food with a score of 89.4% (n=143). Then, it was found that 8.1% (n=13) of the respondents preferred glutinous rice, followed by 1.9% (n= 3) chose brown rice and lastly was other type of rice such as Japanese rice. According to the result, frying method was the most preferred way to consume by the respondents with a score of 52.5% (n=84) and the food prepared included fried rice. Then, 23.8% (n=38) of the respondents chose steaming which included steamed rice. Meanwhile, boiling was the third preferred by respondents with 16.3% (n=26) and the example of the food cooked by using the boiling method is porridge. It was reported that most of the respondents, 55.6% (n=89) prefer to buy the rice at the cafeteria, followed by supermarket 17.5% (n=28). Meanwhile, the least preferred place to buy food by the respondents was convenient stores (1.3%, n=2). Other places like night market or roadside stalls scored as second least preferred by respondents (12.5%, n=20). There were also respondents who bought the rice at groceries with a score of 13.1% (n=21). As shown in the table, 28.8% (n=46) of the students consumed rice once per day. Then, it was found that 24.2% (n=39) of respondents consumed rice 2 to 3 times per day, followed by 2 to 3 times weekly with a percentage of 19.4 (n=31). The frequency and percentage of students that consumed rice 4 times per week is 16.9% (n=27) and only 1.3% (n=2) of the respondents consumed 4 or more times rice per day.

Table 1. Frequency and percentage of respondent preferring rice (N =160)

The Most Preferred Food in Each Type of Group	Frequency	Percentage (%)
White rice	143	89.4
Glutinous rice	13	8.1
Brown rice	3	1.9
Other (e.g. Japanese rice)	1	0.6
The Most Preferred Way of Consumption		
Frying (e.g. fried rice)	84	52.5
Steam (e.g. nasi kukus)	38	23.8
Boiling (e.g. porridge)	26	16.3
Other (e.g. nasi lemak)	12	7.5
The Most Preferred Place to Buy Food/Dishes		
Cafeteria	89	55.6
Supermarkets	28	17.5
Groceries	21	13.1
Other (e.g.night market)	20	12.5
Convenient store	2	1.3
Frequency of The Food Being Taken		
1 time per day	46	28.8
2-3 times per day	39	24.4
2-3 times per week	31	19.4
4 times per week	27	16.9
1 time per week	15	9.4
4 or more times per day	2	1.3

3.2.2 Noodles

Table 2 depicts kuey teow as the most preferred food in the noodle's category with 35% (n=56) chose it. Then, the second preferred food in this category with only 1 vote different with kuey teow was vermicelli with a percentage of 34.4 (n=55), followed by yellow noodle with a score of 18.1% (n=29). The least preferred noodle type was pasta with only 12.5% (n=20). Meanwhile, for the most preferred way to consume noodle, boiling was the most preferred with a score of 57.5% (n=92) and the examples of food included noodles soup and tom yam. The second most preferred way to consume noodle was frying with a score of 35% (n=56) like fried noodles. The results followed by other preference of eating noodle 6.9% (n=11) such as instant noodles and the least preferred way to eat noodles was steaming (0.6%, n=1) like laksam. As depicted in the table, most of the respondents (53.1%, n=85) chose the cafeteria, followed by other places such as the night market with a score of 16.3% (n=26) to buy noodles. Then, 15.6% (n=25) of the respondents chose groceries; followed by 12.5% (n=20) respondents chose supermarkets and the least was convenient stores with 2.5% (n=4). Table 2 also shows the frequency of the noodle being consumed. The percentage of respondents that consumed noodles once a week and 2 to 3 times per week were similar, which is 41.3% (n=66). This was followed by consumption of 4 times per week (10.6%, n=17) and once per day (4.4%, n=7). Then, the least frequency of noodles consumption was 2 to 3 times per day and 4 or more times per day with a score of 1.3% (n=2).

Table 2. Frequency and percentage of respondent preferring noodles (N =160)

The Most Preferred Food in Each Type of Group	Frequency	Percentage (%)
Kuey teow	56	35.0
Bihun	55	34.4
Yellow mee	29	18.1
Pasta	20	12.5
The Most Preferred Way of Consumption		
Boiling (e.g. soup noodles)	92	57.5
Frying (e.g. fried noodles)	56	35
Other (e.g. instant noodles)	11	6.9
Steam (e.g. laksam)	1	0.6
The Most Preferred Place to Buy Food/Dishes		
Cafeteria	85	53.1
Supermarkets	26	16.3
Groceries	25	15.6
Other (e.g.night market)	20	12.5
Convenient store	4	2.5
Frequency of The Food Being Taken		
1 time per week	66	41.3
2-3 times per week	66	41.3
4 times per week	17	10.6
1 time per day	7	4.4
2-3 times per day	2	1.3
4 or more times per day	2	1.3

3.2.3 Bread

Table 3 depicts the frequency and percentage of respondent preferring bread. The current study found that white sandwiches were the most chosen bread among the respondents with a score of 51.3% (n=82). Then, followed by flavoured bread (chocolate and corn flavoured) with 33.1% (n=53). Apart from that, the wholemeal bread was in the third-highest place with a percentage of 15.0% (n=24) and the least preferred was another type of bread (biscuit bread) with a result of 0.6% (n=1). It was reported that the sandwich was the most preferred dishes chosen by the respondents with a score of 20.6% (n = 33), as shown in Table 3. Egg toast was the second preferred meals in bread category (16.9%, n=27), followed by other dishes such as roti pau (12.5%, n=20) and plain bread toast (11.9%, n=19). The finding also showed that the least chosen meal from bread was roti canai and cheese bread with a score of 1.3% (n=2) respectively, followed by vanilla bread (1.9%, n=3). In the category of bread, the table also illustrates the most preferred place chosen by respondents to buy the bread products. Groceries were the most preferred with 30.0% (n=48) followed by the supermarket with 26.9% (n=43). The third-place chosen by the respondents with a score of 19.4% (n=31) was the cafeteria, followed by convenient stores (14.4%, n=23). The least preferred was the bakery shops, which is 9.4% (n=15). For the bread category, according to Table 3 majority of the respondents consumed bread 2 to 3 times in a week with a score of 42.5% (n=68). Then, the second-highest frequency of bread consumption was once per week (31.9%, n=51), the third-highest was 4 times per week (13.1%, n=21) followed by once per day (9.4%, n=15) and 2 to 3 times per day (2.5%, n=4). Meanwhile, the least frequency of bread consumed by the respondents was 4 or more times per day with 0.6% (n=1).

3.2.4 Cereals products

Table 4 shows the frequency and percentage of respondent preferring cereals products. Generally, cold cereal had higher demand among respondents with 75.6% (n=121) while 21.3% (n=34) of the respondents chose hot cereal. Cornflakes were the least preferred (3.1%, n=5). Referring to the most preferred way it is consumed, almost half of the respondents preferred to consume cereal with milk, which is 46.9% (n=75), followed by oatmeal with 20.0% (n=32). They are followed by other cereal selection (as ice cream topping, popia nestum, and etc), 17.5% (n=28), nestum (8.1% n=13) oat with yogurt (5.6% n=9) and only 1.9% (n=3) had oat with Milo. According to Table 4, the supermarket was the best place chosen by the

Table 3. Frequency and percentage of respondent preferring breads (N =160)

The Most Preferred Food in Each Type of Group	Frequency	Percentage (%)
White sandwich	82	51.3
Flavoured (e.g. chocolate and corn flavoured)	53	33.1
Wholemeal	24	15
Other (e.g. biscuit bread)	1	0.6
The Most Preferred Way of Consumption		
Sandwich (e.g. meat, tuna and chicken)	33	20.6
Egg toast	27	16.9
Other (e.g.pau)	20	12.5
Plain bread toast	19	11.9
Plain bread	13	8.1
Spreaded bread	12	7.5
Tuna bun	11	6.9
Corn bread	10	6.3
Sausage bread	8	5
Vanilla	3	1.9
Roti canai	2	1.3
Cheese bread	2	1.3
The Most Preferred Place to Buy Food/Dishes		
Groceries	48	30
Supermarkets	43	26.9
Cafeteria	31	19.4
Convenient store	23	14.4
Other (e.g. bakery shop)	15	9.4
Frequency of The Food Being Taken		
2-3 times per week	68	42.5
1 time per week	51	31.9
4 times per week	21	13.1
1 time per day	15	9.4
2-3 times per day	4	2.5
4 or more times per day	1	0.6

Table 4. Frequency and percentage of respondent preferring cereal products (N =160)

The Most Preferred Food in Each Type of Group	Frequency	Percentage (%)
Cold	121	75.6
Hot	34	21.3
Other (e.g. cornflake)	5	3.1
The Most Preferred Way of Consumption		
Cereal with milk	75	46.9
Oatmeal	32	20
Other (e.g. cereal topping and popia nestum)	28	17.5
Nestum	13	8.1
Oat with yogurt	9	5.6
Oat with milo	3	1.9
The Most Preferred Place to Buy Food/Dishes		
Supermarkets	109	68.1
Groceries	32	20
Convenient store	8	5
Cafeteria	7	4.4
Other (e.g. online purchase)	4	2.5
Frequency of The Food Being Taken		
1 time per week	80	50
2-3 times per week	52	32.5
4 times per week	15	9.4
1 time per day	12	7.5
2-3 times per day	1	0.6
4 or more times per day	0	0

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respondents to buy cereal products, which is 68.1% (n=109) while groceries were ranked second with 20.0% (n=32). This was followed by convenient stores and cafeteria with results of 5.0% (n=8) and 4.4% (n=7) respectively. The rest reported other such as from online purchase with 2.5% (n=4). Apart from that, for the frequency of respondents that consumed cereal products about 50.0% (n=80) of the respondents had it once a week, while 32.5% (n=52) consumed 2 to 3 times per week and 9.4% (n=15) consumed 4 times per week. Besides, the results also reported that only 7.5% (n=12) of the respondents ate cereal product once per day. The least frequency was 2 to 3 times per day 0.6% (n=1).

3.2.5 Biscuits

Table 5 shows that wafer rolls are the most preferred types of biscuits among students with 45.0% (n=72). Crackers dominated the second most preferred biscuit, with 43.8% (n=70) followed by cream biscuits 10.0% (n=16). The least favourite among students with 1.3% (n=2) was the other category of biscuits like biscuit bread. Meanwhile, it was found that the most preferred way to consume biscuit products was flavoured-biscuit with 53.0% (n=85) and cracker with 26.3% (n=42), as the second higher preferred biscuit. Then, it was followed by other preference (taken with milk, coffee and tea), 13.1% (n=21), sandwich biscuits, 3.8% (n-6), and cookies with 2.5% (n=4). Meanwhile, wholemeal biscuits were the least preferred with a score of 1.3% (n=2). Table 5 also shows the place preferences to find biscuit products, reported in frequency and percentage. It was reported that the most favourable place selected by the respondents was the supermarket with 49.4% (n=79). Then, the second favourable to purchase the products was groceries with 39.4% (n=63) followed by convenient stores with 6.9% (n=11). The current study also found that other places like the bakery shop got the least preference with 0.6% (n=1) and followed by cafeteria (3.8%, n=6). The highest frequency of biscuits consumption was 2-3 times per week which is 34.4% (n=55), followed by once in a week, 4 times per week and once per day with a score of 32.5 % (n=52), 13.8% (n=22), and 10.6% (n=17) respectively. The least frequency of consumption was 4 or more times per day and 2 to 3 times per day with a similar result of 4.4% (n=7).

3.2.6 Tubers

Table 6 reports the frequency and percentage of respondent preferring tubers. It was found that potato was the most preferred with a score of 74.4% (n=119), followed by tapioca with the percentage of 16.9% (n=27) and yam 5.0% (n=8) as the third most favourite tubers. Chinese potato and sweet potato, categorized as others, were the least preferred with a score of 3.8% (n=6). For the preference of way it being consumed, the majority of

Table 5. Frequency and percentage of respondent preferring biscuits (N =160)

The Most Preferred Food in Each Type of Group	Frequency	Percentage (%)
Wafer rolls	72	45
Crackers	70	43.8
Creams	16	10
Other (e.g. biscuit bread)	2	1.3
The Most Preferred Way of Consumption		
Flavours	85	53
Crackers or no flavors	42	26.3
Other (e.g. with milk, coffee and tea)	21	13.1
Sandwich biscuits	6	3.8
Cookies	4	2.5
Wholemeal biscuits	2	1.3
The Most Preferred Place to Buy Food/Dishes		
Supermarkets	79	49.4
Groceries	63	39.4
Convenient store	11	6.9
Cafeteria	6	3.8
Other (e.g. bakery shop)	1	0.6
Frequency of The Food Being Taken		
2-3 times per week	55	34.4
1 time per week	52	32.5
4 times per week	22	13.8
1 time per day	17	10.6
2-3 times per day	7	4.4
4 or more times per day	7	4.4

Table 6. Frequency and percentage of respondent preferring tubers (N =160)

The Most Preferred Food in Each Type of Group	Frequency	Percentage (%)
Potato	119	74.4
Tapioca	27	16.9
Yam	8	5
Other (e.g. Chinese potato and sweet potato)	6	3.8
The Most Preferred Way of Consumption		
Frying	69	43.1
Boiled	58	36.3
Other (e.g. steam)	21	13.1
Baked	12	7.5
The Most Preferred Place to Buy Food/Dishes		
Supermarkets	57	35.6
Other (e.g. fresh, morning and night market)	40	25
Groceries	38	23.8
Cafeteria	24	15
Convenient store	1	0.6
Frequency of The Food Being Taken		
1 time per week	111	69.4
2-3 times per week	30	18.8
4 times per week	11	6.9
2-3 times per day	4	2.5
1 time per day	3	1.9
4 or more times per day	1	0.6

the respondents chose the frying method with a score of 43.1% (n=69). The second preferred was boiling dishes (36.3%, n=58). Steam, categorized as others, was the second least preferred way to consume followed by baking with 7.5% (n=12). The finding of the current study found that the majority of the respondents purchased the tuber products at the supermarket with a result of 35.6% (n=57), followed by other places like fresh market, morning market and night market with the score of 25.0% (n=40). Groceries were the third place that the respondents preferred with 23.8% (n=38) while the fourth place was the cafeteria 15.0% (n=24). Meanwhile, the convenient store was the least preferred place with a score of 0.6% (n=1). This study also found that the majority of the respondents (69.4%, n=111) consumed tuber dishes once per week. Respondent (18.8%, n=30) consumed tubers 2 to 3 times per week. Besides, there were also 6.9% (n=11) and 2.5% (n=4) of the respondents consumed tuber products 4 times in a week and 2 to 3 times daily respectively. The least consumption of tuber products was 4 or more times per day with 0.6% (n=1) followed by once per day, 1.9% (n=3).

4. Discussion

4.1 Carbohydrate preference

In this study, the preference of students toward rice was higher than other carbohydrate groups. This is similar to the study done by Supakornchuwong and Suwannaporn (2012). The study reported that compared to pasta and potatoes, rice was the most chosen among majorities of French, Dutch, Belgian and British citizens. This may be due to its taste, low in calorie and give health benefits. Besides, rice also has been known as a staple food in Asian as well as Malaysia, causing it to be the most selected among the consumers (Musa *et al.*, 2011). Furthermore, in a study by Khor (2012), rice was regularly consumed by Malay rural household, along with other food which are anchovies and marine fish. Rice is one of the sources of carbohydrate which is important to provide energy to the body. Rice has been the primary source of calories for the people. For most of the population in the world, especially Asian countries such as Malaysia, rice stood as a staple food for a living (FAO, 2004). Hence in many regions of the world rice is commonly consumed daily, to meet the nutritional requirement of millions of people, as it is the main source of calories (Fathima *et al*., 2017).

4.2 Rice

The most common type of rice is white rice and was chosen by most of the respondents. According to the data by Harun *et al*. (2018), most of the respondents consumed white rice in their daily diets, while brown rice was the least consumed by the respondent. Due to its higher price and unfamiliar taste compared to white rice, brown rice was less preferred. Nevertheless, there were some respondents chose brown rice due to its nutrient and quality content that provide more health benefits. Comparing to the white rice, brown rice is a low glycaemic index (GI) food. In this way, patients that are

vulnerable to type II diabetes are encouraged to consume brown rice (Rohman *et al*., 2014).

From the data, most of the students consumed rice once per day, indicating that they chose rice as their necessary food as well as an energy source for them. Besides, in a study that reviewed the customers' attitudes, it was reported that the respondents were generally purchasing rice once a day. The data is complementary to the Malaysian dietary guidelines that suggested the societies to consume a reasonable amount of rice. Thus, it depicts that most students eat rice once a day. Some of the respondents were concerned about their health, thus they tend to not consume rice more than 1 time per day.

The consumer usually tends to choose the best quality food that is affordable. This can be supported by Hanis *et al.* (2012) as cited in Harun *et al.* (2018), where high-quality rice has been demanded by Malaysians due to changes in their lifestyles. This shows that Malaysians are significantly shifting their perception of healthy products. However, according to a study by Ogundele (2014), socio-demographic and physical factors such as level of education, age, family status, gender, and profession largely influenced the preference of local rice.

4.3 Noodles

Noodle is one of the components in the carbohydrate group. According to Eddyono and Subroto (2014), the government of Indonesia has started the development of healthful meals consumption program, which encouraged their citizens to pick noodles as their primary menu. Based on the questionnaire, noodle is the second carbohydrate food that has been chosen by the respondents. It is a type of food that is mostly consumed by all ranges of age, due to its reasonable price and easy to prepare (Keyimu, 2013). Out of all the noodles, kuey teow was the most preferable, mostly by boiling and frying method of cooking. kuey teow is a type of rice noodles that usually cooked by frying and mixed with sauce or chilli paste (Thomas *et al.,* 2014).

4.4 Bread

Bread is the third preferable carbohydrate group in this study. Although the respondents mostly choose rice, it was found that there was few of them chose bread and wheat instead of rice due to the growth of urbanization nowadays. There is a noteworthy adaptation in dietary energy in Malaysia in terms of the food source. It appears that Malaysians diet patterns are more towards wheat-meat-oil-fat-sugar-based diets, thus shows an increase in wheat preference among them (Soon and Tee, 2014). Malaysian people like to consume bread as a snack especially during breakfast. Nevertheless, Malaysians still need to take rice at least once a day to provide extra energy to do daily activities because bread is not a staple food for Malaysians.

4.5 Cereal products

The finding shows that most of the college students do not like to take cereal products as their main meal. According to some researchers, oat or grains consumption were still lower for many countries. Thus, the government must take actions such as policies implementations, monitoring and evaluation of nutrition habits to encourage and engage people to choose a healthy diet (Mozaffarian *et al*., 2018). There was only 22% of children, specifically, school children in Kuala Lumpur that consumed breakfast daily and the factors that may lead to the consumption of cereal with milk included the availability, convenience and the best way to consume the food (Hui-Chin *et al*., 2015). Besides, for university students, it was recommended to increase their nutritional knowledge to increase a healthy eating habit (Halim and Mohd Yusof, 2017).

4.6 Biscuits

In a previous study on the food consumption pattern among Malaysian adults, it was reported that biscuit was in the list of the most consumed food daily among the age group. Besides, the idea from the manufacturer, which is using the small convenience packaging, had help in promoting people to consume biscuits. Cracker is the second-highest preference among youth. According to Neo *et al*. (2007), as cited in Norhayati *et al*. (2015), crackers are solely preferred by Malaysian consumers due to its unsweetened, crispy, salty, creamy and thin characteristic, which remarkably increase the sales of biscuit in Malaysia.

4.7 Tubers

The data shows that tubers are the least chosen by the respondents. However, the intake of potato is expected to increase in the future, as Malaysians tend to follow the western trend. Rapid nutrition transition in developing countries is mainly caused by globalization, which subsequently increments the number of Western fast-food franchises and supermarkets (Lipoeto *et al*., 2013). This shows that people nowadays are attracted to western food. Meanwhile, the substantial items sold at western fast-food restaurants are fried food commonly potato French fries (Cahill *et al*., 2014). Hence, the increasing number of fast-food consumption as well as unhealthy food choices was due to the availability and accessibility of fast-food restaurants (Abdull Hakim *et al*., 2012). It was found that the majority of the

respondents consumed fried food daily. Potato chips and French fries, types of food derived from tubers, were commonly consumed among fried products, supported with the result of this study. However, continuous fried food consumption is not advisable as it may lead to various health risks.

Regarding the data, most respondents chose to buy food at the cafeteria and supermarket. Based on a study by Lateef *et al*. (2016), most respondents chose to have outside food instead of cooking it themselves. This matter may be due to regulations in college that cooking is prohibited. Therefore, the nearest place that they were able to access the food was the cafeteria. Cafeteria probably serves more varieties of food at cheaper prices than restaurants or a fast-food franchise. The availability of the food supplied in the store might attract the customer to purchase the meal at the outlet (Hawkins and Mothersbaugh, 2010). Musa *et al.* (2011) stated that the factors affected the choice of place to purchase the food were food accessibility, including the distance of the store with their house or college. Based on a study by Gan *et al.* (2011), as cited in Lateef *et al*. (2016) most of the university students in Malaysia choose food according to the price and availability. This may be worrisome since their healthy eating pattern will be changed.

5. Conclusion

In summary, the study shows the top preference for each of the food in carbohydrate according to the most preferred food in each type of group, the most preferred way of consumption, the most preferred place to buy food/dishes and the frequency of the food being taken. Rice was the most preferred carbohydrate and it was due to its role as the staple food for the Malaysians, in comparison with biscuits, bread, cereal products, tubers and noodles. Frying was the most preferable cooking method for rice chosen by the respondents. Besides, most of the student had chosen cafeteria as the most preferred place to find the rice and the majority of the respondents consumed rice 1 time per day. Therefore, the current study has increased the information regarding food preference among university students. Some of the contributors to these results were due to the types of food sold at the food stalls or cafeteria inside or outside the university as well as food prices. Hence, for future study, it is recommended to widen the study to all youth in Malaysia to see the big picture of food preferences that may support balance intake of carbohydrate and healthy eating practices among youth in Malaysia. This can give some ideas and more room for monitoring healthy eating practice among university students. This will also help the food provider in preparing and modifying healthy meal according to food preferences at the university's cafeteria. In addition, this may also assist food manufacturer to get some strategies for developing healthier food innovation in the future based on youth preference. This simultaneously may spread a big spectrum for food providers and manufacturers to sell and develop healthy food choices for the students to improve their health and avoid health problems or diseases in future.

Conflict of interest

The authors declare no conflict of interest.

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