ORIGINAL ARTICLE

Development and Validation of Culinary Nutrition Questionnaire to Assess Chefs' Culinary Nutrition Knowledge, Attitude and Practice (KAP)

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ABSTRACT

Introduction: Culinary nutrition is a science that aims to apply nutritional concepts into culinary art to serve healthier foods. This study aimed to develop and validate a newly developed culinary nutrition questionnaire to assess chefs' culinary nutrition knowledge, attitude and practice (KAP). **Methods:** The KAP questionnaire was developed to be consistent with the Malaysian Dietary Guideline (2010) and Malaysian ingredients. It consisted of 31 items and tested its content validity among four experts using Content Validity Index (CVI), followed by back-to-back-translation process. Finally, 180 chefs answered the questionnaire followed by statistical analysis to evaluate the construct validity using Exploratory Factor Analysis (EFA) and reliability using Cronbach alpha. **Results:** One item was deleted after content validity and four items were omitted after testing the construct validity because their lower factor loading value. The Kaiser-Meyer-Olkin (KMO) value was derived from (EFA) for knowledge section is 0.631 with total variance 34.7%, attitude is 0.665 with total variance 53.1%, and practice section is 0.841 with total variance 54.6%. The total Cronbach alpha value was 0.712. The Cronbach alpha value for knowledge, attitude, and practice domains were 0.77, 0.73, and 0.88 respectively. **Conclusion:** The final draft of the questionnaire consisted of 26 items. The questionnaire is valid and reliable. This questionnaire is suitable to be used to assess chefs' culinary nutrition knowledge, attitude and practice (KAP).

Keywords: Culinary nutrition, Reliability, Validity

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INTRODUCTION

Malaysia is one of the most attractive tourism destinations in the world, ranking among the top 14 countries to be visited (1). Food and tourism relationship is interconnected, while traveling food does not only act as a basic need, but it also contributes to the overall memorable cultural experience (2). Recently, tourists have been more concerned about the presence of healthy and nutritious food during their vacation than just trying local food (3).

Moreover, by studying international tourists' attitude towards Malaysian foods. Tourists specified that they did not prefer Malaysian food due to high fats and unhealthy cooking techniques like deep-frying (4). Thus, it became a great challenge during their stay in Malaysia (4). For examples, tourists tend to avoid oily gravy, a layer of oil, or ghee floating on food (5). They prefer low calories menu of low saturated and trans-fats, refined flour, using olive oils, and increasing organic fresh vegetables, stir-fried and baked dishes on the menu (5).

For that reason, chefs are considered as a key player to encourage healthy eating behavior and helping the food industry to be competitive in the future by serving a healthy and nutritive menu (6). Chefs must be able to develop new menus that are suitable for customers' demands for healthier and low-fat food options (7). Furthermore, they have to understand tourists' needs while designing their menu; incase the tourist follows a special diet like low calorie, vegetarian, or suffer from any type of food allergy (8). Besides, researcher like Condrasky & Hegler (9) highlighted the importance of culinary nutrition for the chef in the food industry. Culinary nutrition science aims to apply nutrition and food science concepts through cooking skills in order to serve healthier and tasty meals (9). Despite, previous studies such as Obbagy et al. (10) have evaluated

the culinary nutrition knowledge of chefs in the food industry. They found that chefs' nutritional knowledge is the vital challenge faced by restaurants to serve a healthy menu. Also, Condrasky et al. and Reichler & Dalton (11, 12) designed a questionnaire to assess chefs' culinary nutrition knowledge consistent with American dietary guidelines. They mentioned that fats, salt, and sugar are the most important nutritional aspects that must be evaluated among chefs.

In Malaysia, only one qualitative study has evaluated the nutritional knowledge among food handlers in the foodservice sector (13). Salhadi et al. (13) have interviewed food handlers, managers, and cleaners to identify their understanding of a healthy cafeteria. The interview involved in topics on food safety, food hygiene, and method of cooking. However, this study did not assess on chefs' nutritional knowledge. Thus, this study aimed to develop and validate a culinary nutrition questionnaire to assess chefs' culinary nutrition knowledge, attitude and practice (KAP).

MATERIALS AND METHODS

Data collection
According to Salkind NJ (14), to determine the number of participants needed to conduct construct validity, the variable ratio (N: P) need to be calculated. Where V is number of participants and P is number of variables or items. In addition, the recommended ratio should be 5:1, while the maximum ratio can reach 10:1 (14). In this study, number of items in the questionnaire is 30 and variable ratio used was 6:1. Thus, number of participant needed is 180. Sampling method using in this study is proportional stratified sampling. A list of hotels in Kuala Lumpur from the Ministry of Tourism, Art and Culture Malaysia was used. Only 121 hotels out of 183 have fulfilled the inclusion criteria. Referring to Kuala Lumpur map from Malaysian Center for Geospatial Data Infrastructure, Kuala Lumpur divides into seven districts (Mukim) which include: Ampang, Batu, Cheras, Ulu Kelang, Kuala Lumpur, Petaling, and Setapak. Next, sampling hotels are divided into four proportional groups or stratum according to the number of hotels in each district in Kuala Lumpur. Batu, Ulu Kelang, and Setapak were excluded because of the absence of star-rated hotels in these districts.

Instrument design
On the basis of extensive literature reviews and qualitative interviews with four experts which consist of dietitian, nutritionist, food-service lecturer and chef to determine the main dimensions and questionnaire format. The questionnaire was designed in order to be consistent with the Malaysian Dietary Guidelines (15) and local ingredients. It consisted of four sections. The first section is socio-demographic questions including (age, race, gender, chefs' positions, salary, and years of experience, if the respondents suffer from any chronic diseases).

The second section consist of 14 questions on knowledge with the answer choices in the form of Likert scale (strongly disagree/ disagree/ neutral / agree/ strongly agree). The third section includes nine attitude questions where respondents need to answer based on the Likert scale (strongly disagree/ disagree/ neutral / agree/ strongly agree). The fourth section involved nine practice questions which require the respondent to answer by the frequency of the practice (never –rarely -sometimes –often - always).

Content validity
The evaluation of the content validity was performed by asking the same experts to evaluate the relevance and clarity of each item using four Likert scales (4 = very relevant, 3= relevant, 2= irrelevant 1= very irrelevant), (4=very unclear, 3=unclear, 2=clear, 1=clear) (16). The content validity index of each item (I_CVI) was calculated by using the formula below (16):

$$I\_CVI = \frac{\text{Number of experts who rated item 3 or 4}}{\text{Total number of experts}}$$

The value of (I_CVI) considers acceptable when it is =1 (17). To calculate the content validity indexes for scale (S_CVI), the average of the item-level CVI (S-CVI/Ave) had to be calculated (17).

$$\text{Where (S-CVI/Ave)} = \frac{\text{the sum of I-CVI}}{\text{The total number of items}}$$

The acceptable range for S_CVI or of each subscale are ≥0.80 and ≥0.90 (17).

Back-to-back translation and face validity
The next process involved back-to-back translation and face validity. The initial questionnaire (version 1) was forwarded to two native Malay translators with five years of experience in the health care field (N=2) for the English translation of the questionnaire into the Malay language (version 2). Furthermore, the translated questionnaire (version 2) was forwarded to the same four experts of the content validity stage to get their feedback and comments, thus evaluating its face validity for ambiguity and clarity. Finally, the Malay language questionnaire (version 2) was retranslated back to the English language (version 3) by two different native Malay translators with experience of over five years in the medical and health care field (N=2). A comparison was made between the original draft (version 1) with (version 3) by the researcher and a Malay dietician expert with over 10 years' experience, to reconcile any meaningful differences between the two drafts.

Construct validity
To evaluate the construct validity exploratory factor analysis (EFA) test was used to explore if questionnaire

'items reflect the main objectives of the study (18). Also, it was used to find the correlation between variables using factor loading, Kwaiser-Meyer-Olkin (KMO) and Bartlett's test. Factor loading of each item considers acceptable if it is higher than 0.3, also (KMO) value considers significant if it is higher than 0.60. Bartlett's test of sphericity (P<0.05) (19).

Reliability

After conductcting content, face and construct valiidty. Internal consisitny was evelated using Cronbach's alpha value. Cronbach's alpha is the widest measurement used to evaluate reliability, the accepted value for it is ≤0.7 (20).

Ethical clearances

This study was approved by the research ethics committee, Faculty of Heath Science, Universiti Kebangsaan Malaysia No. UKMPPI/111/8/JEP-2019-168.

RESULTS

Socio-demographic

Table I shows the socio-demographic characteristics of respondents. Majority of the participants were male (76%), aged less than 25 years (27.2%) and between 26 to 30 years (28 %). Furthermore, majorities of the respondents were Malay with education level up to Diploma (39.4 %) (73.3 %). From the total subjects,

Table I: Socio-demographic characteristics of respondents

Variables		N	%
Gender	Male	137	76
	Female	43	24
Age	Less than 25	49	27.2
	26-30	50	28
	31-35	20	11.1
	36-40	29	16.1
	41-46	14	7.7
	46-50	12	6.6
	51-55	2	1.1
	56-60	4	2.2
Race	Malay	149	73.3
	Chinese	16	6.7
	Indian	9	0
	Others	6	20
Education	Primary	8	4.4
	Spm	24	13.2
	Stpm-a level	64	36
	Diploma	71	39.4
	Degree	10	6
	Others	2	1
Experience	1-5 years	82	45.5
	6-10 years	32	17.7
	More than 10	66	36.6
diseases	yes	5	2.8
	no	175	97.2
Salary	1500-2500	65	36.1
	2500-3500	45	25
	3500-4500	22	12.2
	More than 4500	48	26.7
Position	Comis	40	22.2
	Chef de partie	32	17.8
	Sous –chef	49	27.2
	Executive -chefs	59	32.8

45.5 % of them had working experience of less than 5 years. In term of positions, 22.2% were Comis chef, 17.8 % were Chef de partie, 27.2% were Sous-chef and 32.8% were Executive chef.

Instrument design

Based on the first draft of the questionnaire, experts have suggested changing from 'To lower your sugar level you need to reduce the amount of carbohydrates from noodles and rice" into 'to lower the glucose level you need to reduce the amount of carbohydrates from noodles and rice. Next, the experts suggested changing from 'I reduce the amount of sugar in baking' into 'I reduce the amount of sugar in recipes'. Finally, the question 'I use salted fishes' was recommended to change into 'I use fresh chicken stock instead of chicken cubes'.

Content validity

The initial draft of the questionnaire consisted of 31 items and was circulated among experts to evaluate its relevance and clarity. According to the results of I_CVI, only one question out of the 31 was deleted for its low I-CVI (0.5) and content validity index of scale (SVI / Ave) for relevancy and clarity of knowledge is (0.92) and for attitude and practice section is one.

Back -to -back translation and face validity

After translating the questionnaire, experts suggested many comments on language and the clarity of the questionnaire in Malay version that had been taken into consideration.

Construct validity

The KMO test and Bartlett's test of sphericity for knowledge section (KMO test =0.631, chi-square =127.4, p=< 0.001), for attitude section (KMO=0.665, chi-squared= 174.7, p=< 0.001) and finally for practice section (KMO= 0.841, chi-squared= 458.561, p=< 0.001). As shown in Table II the final model the knowledge section, two items were omitted because their factor loading values were less than 0.3. Two dimensions were identified with 10 items and a total variance explained of 34.7% and factor loading range between 0.35 and 0.69. The first dimension was grouped under Malaysian Dietary Guideline knowledge with four items. The second dimension was grouped with six items under food nutrient source knowledge.

For the attitude section as can be seen from Table III, two items were deleted because their factor loading was lower than 0.3. The remaining items had factor loading range between 0.53 and 0.86 and a total variance 53.1%. Two dimensions were identified for the attitude section, chefs 'barriers to serving healthy food with three items and chefs' attitude toward healthy cooking with four items. Finally, Table IV shows, the factor loading for the practice section ranged between 0.46 and 0.86 and a total variance 54.6%, and no item was deleted. Furthermore, two dimensions were identified for the

Table II : Factor loading and Cronbach alpha value of knowledge section

	Malaysian dietary guideline	Nutrient source	KMO	Total variance	Cronbach alpha
Tofu is considered as a good source of protein		0.69			
One must consume milk and dairy product 4 cups per day.	0.35				
Brown sugar is good for the diabetic customer.	0.59				
Palm oil contains saturated fats which are good for health.		0.487			
Bee hoon and noodles contain complex carbohydrate.		0.57			
To lower your glucose level you need to reduce the amount of carbohydrate from Noodles and rice.	0.644				
Many foods labeled 'fat free' are generally lower in sugar , refined carbohydrate and calories		0.55			
The Malaysian dietary guideline is composed of 7 groups of food	0.615				
Cholesterol is only found in animal products.		0.53			
Salmon and mackerel contain healthier fats than red meat.		0.59			
Noodles have more fiber than vegetables	_				
A healthy meal should consist of half meat, a quarter vegetable, and a quarter side dish.	_				
			0.631	34.7%	0.77

Table III: Factor loading and Cronbach alpha of attitude section

	Dimension		KMO	Total variance	Cronbach alpha
	Chefs' attitude toward healthy cooking	Chefs' barriers to serve healthy food			
I like to modify the recipe to be healthier with acceptable taste.	0.538				
Chefs are responsible to prepare healthy food.		0.746			
I like to increase the amount of fruit and vegetable in my menu.	0.701				
Preparing healthy food is costly.		0.868			
Chefs are not trained to implement the Malaysian food pyramid on a practical level		0.746			
I'm interesting in learning healthy cooking techniques and nutrition	0.709				
Nutrition is taking in consideration while planning menu	0.592				
Preparing a healthy meal is time-consuming.	_				
Reducing the portion size of meat in dishes would cause customer to complain	_				
			0. 665	53.1%.	0.73

Table IV: Factor loading and Cronbach alpha value of practice section

	Dimensions		KMO	Total variance	Cronbach alpha
	Healthy cooking technique	Healthy food alternative			
Before using food product , I read the nutritional label	0.840				
I use whole grain in the baking instead of refined flours		0.723			
I reduce the amount of sugar in recipes	0.717				
I remove the chicken skin before cooking to reduce the amount of fat	0.582				
I use fresh chicken stock instead of chicken cubes		0.460			
I bake my chicken instead of frying to reduce the amount of fats	0.728				
I reduce the soy sauce and seasoning powder in order to limit the salt consumption		0.506			
I cook vegetable for only a few minutes to prevent diminish vitamins	0.805				
I use milk instead of coconut milk during cooking		0.738			
			0.841	54.6%	0.88.

practice section healthy food alternative with four items and healthy cooking technique with five items.

Reliability
The internal consistency was evaluated using Cronbach's alpha value. As shown in Table II, the Cronbach's alpha value for the knowledge section is 0.77 and for the attitude section is 0.73 as presented in Table III. The practice section value is 0.88 as shown in Table IV. Finally, the total value of Cronbach's alpha is 0.71.

Final questionnaire
After item deletion, the knowledge had a total of ten items each, the attitude had seven items and practice comprised nine items each. Each statistical test progressively improved the questionnaire, which resulted in a total of 26 items.

DISCUSSION

The culinary nutrition questionnaire is considered an important tool to evaluate the nutritional knowledge, attitude and practice of individuals involved in the culinary field. Specifically, the questionnaire follows the local standards such as Malaysian Dietary Guideline and includes the local ingredients. The newly developed questionnaire was tested for its validity and reliability. These included content validity by experts panels, back to back translation, face validity, construct validity using expletory factor analysis and finally reliability using Cronbach alpha. In the first phase, after developing the first draft of the questionnaire, Experts 'opinions and suggestions is an important stages to develop an instrument to improve the clarity and the linguistic of the questionnaires. Experts' suggestions could be by adding, removing, or modifying items during the instrument design stage or validation and translation stage. In this study, experts suggested changing some questions because it will be difficult for chefs to reduce the amount of sugar. Also, some local food like Sambal Belacan and Nasi Lemak will be difficult to prepare without fried anchovies because it is considered as the main ingredient of Malaysian food.

The content validity test is a quantitative method to evaluate the questionnaire among experts. It was examined and evaluated by four experts and only the question of 'to test the freshness of fish the firm must be solid and elastic' was omitted because it was more related to food hygiene than a nutritional topic. In comparison to the previous study (21) which developed a general nutrition knowledge questionnaire for Ugandan adult, the content validity of the knowledge section and the total (I_CVI) scores in the recent study were slightly lower than the previous study (21).

The structure of the questionnaire was evaluated using exploratory factor analysis (EFA). The exploratory factor analysis (EFA) is a method to find the correlation between

factors and identify dimensions (22). The Kaiser-Meyer Olkin (KMO) index is a statistical test that determines the adequacies and appropriateness of items (22). In this study, all sections had a significant KMO value. And, two items were deleted in the knowledge and attitude sections because they were lower than 0.3. But, all items in the practice section had factor loading higher than 0.4. Factor analysis is an important test to identify items and grouped them to give them appropriate meaning. Each variable in this study was grouped into two dimensions.

In reviewing the literature, Cronbach's alpha value considers acceptable if it is higher than 0.7, good 0.9 > $\alpha \geq 0.8$, and excellent if it is ≥ 0.9. In this study, only the practice section has a good reliability value. Knowledge section, attitude and the total Cronbach's alpha value of the instruments consider acceptable because they were lower than 0.8.

The limitation of this study is conducting construct validity on a small scale of chefs. This was because of the chefs' workload and the tight time of Ramadan and Eid. The bigger scale would always give more accurate results.

CONCLUSION

This study has developed a culinary nutrition questionnaire and tested its content, face construct validity. The questionnaire is reliable and valid based on statistical analysis. The questionnaire considers as an important tool to assess culinary nutrition (KAP) for the Malaysian food-service sector. It is recommended for further research, to use this questionnaire to evaluate the culinary nutrition KAP among Malaysian chefs and food handler. Furthermore, to study the impacts of culinary nutrition programs on chefs in the Malaysian food-service sector.

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