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Kertas Asli/*Original Articles*

Association between Knowledge, Attitude, and Practice of Nutrition and Food Labels among Selected Higher Educational Institution Students in Klang Valley

(Hubungan antara Pengetahuan, Sikap dan Amalan terhadap Pemakanan dan Label Makanan dalam Kalangan Pelajar Institusi Pengajian Tinggi di Lembah Klang)

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ABSTRACT

Nutrition information on food labels guides consumers to purchase healthier food choices. Besides nutrition information, other factors influence a purchase. This study aims to determine the association between the knowledge, attitude, and practice (KAP) among tertiary students on nutrition and food labels. In this cross-sectional study, a total of 190 students from three tertiary institutions within Klang Valley completed an online survey. Self-administered questionnaires on sociodemographic profiles and KAP questions, available in Malay and English, were distributed. Association between KAP was determined using Spearman's Rho test, while multiple linear regression was used to assess predictors of KAP scores. Mean body mass index (BMI) of the respondents were 20.8 kg/m2. The total mean score for knowledge on food labels was 8.93, followed by attitude and practice with 3.86 and 3.11, respectively. There was a significant correlation between attitude and practice ($p<0.005$). Nutrient and total calorie information on food labels influenced purchases, with 56.3% of respondents reported looking at the total calorie content, followed by 55.7% and 49.5% checking on sugar and fats, respectively. In addition, other factors such as expiry date (60.9%) and price (59.9%) also influenced purchases. Overall, respondents have a positive attitude on food selection, but male respondents have better knowledge levels than females. However, female respondents interpret food labelling effectively compared to male respondents. Despite having good knowledge and attitude towards nutrition, respondents were still making poor choices. A more extensive range of healthier food options and targeted healthy eating campaigns may empower students to choose more nutritious foods.

Keywords: Knowledge; attitude; practices; food labels; tertiary students

ABSTRAK

Maklumat nutrisi pada label makanan membantu pengguna untuk membeli makanan yang lebih sihat. Selain itu, terdapat pelbagai faktor lain yang mempengaruhi pembelian. Kajian ini bertujuan untuk mengenalpasti hubungan antara pengetahuan, sikap dan amalan (KAP) dalam kalangan pelajar tertiari terhadap nutrisi dan label makanan. Dalam kajian rentas ini, sejumlah 190 orang pelajar daripada tiga institusi tertiari di Lembah Klang telah melengkapkan borang tinjauan secara atas talian yang merangkumi soalan berkaitan dengan sosiodemografi dan KAP yang terdapat dalam dua versi iaitu Bahasa Melayu dan Bahasa Inggeris. Hubungan antara KAP ditentukan dengan menggunakan ujian Spearman's Rho manakala kaedah regresi linear berganda (multiple linear regression) digunakan untuk menganalisis prediktor skor KAP. Indeks jisim tubuh (BMI) responden adalah 20.8 kg/m2. Jumlah skor min bagi pengetahuan label makanan adalah 8.93, diikuti dengan sikap dan amalan masing-masing berjumlah 3.86 dan 3.11. Terdapat korelasi yang signifikan antara sikap dan amalan ($p<0.005$). Maklumat nutrien dan jumlah kalori pada label makanan mempengaruhi pembelian dimana 56.3% responden merujuk pada kandungan kalori tersebut. Di samping itu, 55.7% responden merujuk kandungan gula dan 49.5% responden pula merujuk kandungan lemak pada label makanan. Tambahan lain seperti tarikh luput (60.9%), harga (59.9%) juga mempengaruhi pembelian dalam kalangan responden. Kesimpulannya, responden kajian ini mempunyai sikap positif dalam pemilihan makanan namun didapati responden lelaki mempunyai pengetahuan yang lebih baik berbanding responden perempuan. Walaupun begitu, responden perempuan pula dapat menginterpretasi maklumat pada label makanan secara efektif berbanding responden lelaki. Lantaran itu, kajian mendapati responden mempunyai pengetahuan, sikap dan amalan yang baik berkenaan pemakanan

namun masih rendah dalam mempraktikkan pengetahuan pemakanan ketika memilih makanan. Peningkatan kepelbagaian pilihan makanan yang lebih sihat serta kempen pemakanan sihat dapat memperkasakan pilihan makanan oleh para pelajar.

Kata kunci: Pengetahuan; sikap; praktis; label makanan; pelajar tertiari

INTRODUCTION

Almost 1.7 million Malaysian adults suffer from non-communicable diseases (NCD) such as diabetes, hypertension, or hypercholesterolemia (NHMS 2019). There is an indistinct relationship between NCD and abnormal body weight; thus, the prevalence of overweight and obesity among tertiary students around 21.2% and 16.3%, respectively, is quite concerning (Radzi et al. 2019).

Students consume a much healthier diet at home than when they dine out on campus (Sogari et al. 2018). According to Genena et al. (2017) and Ul Haq et al. (2018), eating behavior changes when they eat out as they tend to consume foods higher in fat content and snack excessively. Changes in dietary practices are related to independence in making food choices. In addition, the opening of fast food stores nearby tertiary institutions increases the opportunity to dine out (Yun et al. 2018). This often leads to unhealthy food habits and an increased risk of obesity, directly impacting nutritional status.

Food labels provide consumers with nutrition information about pre-packaged foods (Norazlanshah et al. 2013). It is a vital communication tool between consumers and food manufacturers (Ambak et al. 2018) and a valuable tool to empower students to make healthier food choices (Cecchini et al. 2016). Food labels have also been shown to increase nutritional awareness whereby consumers who use them reduce consumption of beverages high in sugar and increase their fruit and vegetable intake (Haidar et al. 2017; Malek et al. 2012) However, the utilization of food labels among young Malaysian consumers is poor (Zainol 2021). Many young adults, 53.6%, do not use food labels (Norazmir et al. 2012). Up to 93.1% of students only sometimes practiced using food labels (Evelyn et al. 2020). The most common reason reported was not being interested in using food labels (38.0%). It was followed by not understanding the food label (19.2%) and time constraint (17.7%). Most often, a large number of people were concerned about the expiry date (78.6%) compared to the nutritional facts (24.8%) (NHMS 2017). Other factors that influence food purchasing are price, packaging, amount or size, brand, language used, size of the labels, and taste.

A knowledge, attitude, and practice (KAP) study are one of the most effective methods enabling respondents to record their thoughts or statements via structured and standardised questionnaires. It is then converted into quantitative and qualitative information (Gumucio et al. 2011). In general, education level also influences the KAP of nutrition and food labels, as a certain level of understanding is required to comprehend the nutritional information. Thus, this study was aimed to determine the association between KAP among tertiary students on nutrition and food labels. The information obtained from this study would be helpful to understand the predisposition towards healthy food choices among Malaysian tertiary students.

MATERIALS AND METHODS

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study obtained ethical approval from the Medical Research Ethics Committee of the Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2021-267). A consent form was given to the respondents before data collection. Respondents were anonymised to ensure confidentiality.

STUDY DESIGN

This cross-sectional study was conducted from October 2020 to June 2021. The respondents were students from three higher educational institutions around Klang Valley. Data collection was conducted online using Survey Monkey (https://www.surveymonkey.com/) as most of the students were in their respective homes due to the Movement Control Order (MCO) in Malaysia due to the Covid-19 pandemic. Eligible participants had to complete a self-administered questionnaire containing sociodemographic profiles and KAP questions regarding nutrition and food labels.

SAMPLING AND SUBJECTS

The sampling method used was the snowball technique, whereby information of this study was passed through WhatsApp to the respondents as face-to-face recruitment was not possible due to the pandemic. The study questionnaire was then distributed through social media applications such as *WhatsApp*, *Facebook* and *Instagram*.

The inclusion criteria for the respondents were Malaysian students aged between 18-30, currently studying in higher educational institutions such as polytechnics, public or private universities, and who could read and write in Malay or English. The exclusion criteria were part-time students and first-year students who had not been on the campus since enrolment due to the pandemic.

SAMPLE SIZE CALCULATION

The sample size required was calculated by using the formula Cochran, 1963 whereby n=sample size, Z=1.96 (level of confidence 95%), p=0.5 (expected proportion in population for maximum variability), and e= 0.05 (desired level of precision).

A total of 196 respondents was required. By considering a dropout rate of 20%, 40 additional respondents were needed. Thus, a total of 236 respondents were required to participate in the study.

THE KAP QUESTIONNAIRE

A self-administered questionnaire on KAP was developed and adapted from previous studies (Nurliyana et al. 2011; Seward et al. 2018). The questionnaire underwent content validity, and it was piloted in a small subgroup of students. (Tsang et al. 2017). A panel of five experts conducted content validity consisted of two clinical dietitians, a dietitian with expertise in public health, a nutritionist, and an educator. The panel assessed the survey questions for accuracy of the KAP domains, clarity of the questions, and interpretability. The panel was asked to go through the questionnaire and provide suggestions on content within each section if they were worded clearly or ambiguous. They were asked if the questions were relevant to the study population and were asked to correct any wording or statements and include suggestions to the questionnaire. These were done using track changes using a word document and questionnaires were amended based on these suggestions (Lam et al. 2018).

Meanwhile, after corrections were made, the questionnaire was piloted among 20 higher educational institution students who met the eligibility criteria. They were asked to provide their feedback on the content and clarity of the questionnaire to tertiary students towards comprehending the questionnaire. The respondents were required to evaluate questionnaire items on understanding the questions, presentation, and vagueness level. The comments were collected to further refine the questionnaire, whereby a revised and finalized version was produced based on content validity and piloting findings. In this study, the questionnaire used was bilingual (Malay and English language). The initial questionnaire was drafted in English and underwent "forward-backward-forward" translation, translating the questionnaire from English to Malay then back to English. The purpose of translated in forward and backward was to maintain the meaning of the content (Tsang et al. 2017). A panel of experts assessed the original questionnaire and back-translated version for equivalency. There were no significant amendments made.

The questionnaire was mainly divided into four sections: (1) demographic, (2) knowledge, (3) attitude and (4) practice towards nutrition and food labels. The respondents' demographic profiles including age, gender, ethnicity, types of institution, weight, height, self-reported physical activity level. The respondents were asked to report this based on the amount of time and frequency, and this was then categorized as sedentary (no physical activity), low (<30 mins/day, 2-3days/week), moderate (>30 mins/day, 5-6days/week) and high (>60 mins/day, active daily). The categories were adapted from the compendium of physical activities (Ainsworth et al. 2000).

In addition, current educational level and household income were collected. There were ten multiple-choice questions on nutritional knowledge based on essential nutrition and food labels with a maximum of 10 points. Knowledge levels were determined based number of correct answers as each correct answer was 1 point, whereas incorrect or uncertain answers were given 0 points. Meanwhile, both the attitude and practices questions also consisted of 10 items each. The questions on attitude were based on the health belief model, which assessed attitude towards healthy eating patterns. These were based on a Likert scale whereby the five scales were strongly disagree, disagree, neutral, agree, and strongly agree, whereby points were ascending from a scale of 1 (strongly disagree) to 5 (strongly agree). The practice-related questions were on a scale of 1-4 (never, rarely, sometimes, and always), whereby the frequency of aspects on food labels utilization was assessed.

STATISTICAL ANALYSIS

All analyses were performed by using IBM SPSS Statistics version 25.0 statistical software. The results were presented as frequency and percentage for qualitative data. Kolmogorov-Smirnov test was used to examine the normality of the data as the respondents were more than 100. Spearman's Rho test was used to determine the

difference in KAP among university students. Meanwhile, multiple linear regression was used to identify the correlation between KAP with the sociodemographic data. The interpretation of correlations were based on following criteria: 0-0.25 = weak, 0.25-0.5 = fair correlation, 0.5-0.75 = good correlation and greater than 0.75 = excellent correlation (Mesfin et al. 2013). Significant correlations between KAP and sociodemographic data were then identified by using the Mann-Whitney test and Kruskal-Wallis test. A p-value less than 0.05 was considered significant.

RESULTS

SOCIODEMOGRAPHIC PROFILE OF RESPONDENTS

A total of 190 respondents aged between 18-29 years from higher education institution of completed this study out of 255 who were recruited. Respondents were mainly from University Kebangsaan Malaysia (UKM) and International Medical University. The demographic characteristics of survey respondents are in Table 1. The majority of the respondents were between 20 and 29 years of age (98.4%), with 83.2% female. 71.1% of the respondents were Chinese and 67.7% had a normal body mass index (BMI). The mean BMI of the respondents was 20.8 ± 0.23 kg/m^2. whereby male students (21.7 ± 0.56 kg/m^2) had slightly higher BMI compared to females. (20.6 ± 0.26 kg/m^2). Almost half of the respondents (53.1%) reported low physical activity levels, exercising less than 30 minutes per day with the frequency of 2-3 days per week. Only 32.8% of respondents were from UKM, whereas the others were from IMU and private colleges. However, only 75% of respondents reported their household income. Among them, 24.5% had a household income less than RM 3000 per month, followed by 18.8%, and 15.6% with a household income in the range of RM 3001 to RM 5000 and more than RM 9000, respectively.

KNOWLEDGE OF NUTRITION AND FOOD LABELLING

Many respondents scored 88% and above for nine out of 10 questions on nutrition and healthy food choices. Most respondents have good knowledge of macronutrients for a balanced diet, healthy cooking methods, calories, fats, sugar, and salt content. However, only 75% could ascertain the relationship between nutrient intake and beneficial food choices. In addition, 52.6% of the respondents did not understand the energy provided by each type of

Table 1 Demographic characteristics of respondents

Characteristic		Respondents (n=190) N (%)
Age Group	18 – 19	3 (1.6)
	20 – 29	187 (98.4)
Gender	Male	32 (16.8)
	Female	158 (83.2)
Ethnicity	Malay	35 (18.4)
	Chinese	135 (71.1)
	Indian	8 (4.2)
	Other	12 (6.3)
Body Mass Index (BMI)	Underweight (<18.5 kg/m2)	46 (24.2)
	Normal (18.5 - 24.9 kg/m2)	128 (67.4)
	Overweight (25.0 – 29.9 kg/m2)	12 (6.3)
	Obese (≥30 kg/m2)	4 (2.1)
Types of Institution	Private University	107 (56.3)
	Public University	63 (33.2)
	College	20 (10.5)
Physical Activity Level	Sedentary (Not active, sitting, lying)	43 (22.6)
	Low (<30 mins/day, 2-3days/week)	100 (52.6)
	Moderate (>30 mins/day, 5-6days/week moderate-intensity activities)	40 (21.1)

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Continuation...

	High (>60 mins/day, moderate or vigorous intensity activities)	7 (3.7)
Current Education Level	STPM/Matriculation/Diploma	17 (9.0)
	Degree	172 (90.5)
Household Income	< RM 3000	47 (24.7)
	RM 3001 – RM 5000	35 (18.4)
	RM 5001 – RM 7000	16 (8.4)
	RM 7001 – RM 9000	15 (7.9)
	> RM 9000	29 (15.3)
	Prefer not to say	48 (25.3)

macronutrient. Overall, it is safe to say that most respondents have good knowledge about nutrition, balanced diet, and healthy eating, with a total average score of 8.92.

HEALTH-BELIEF RELATED ATTITUDE

Most of the respondents selected a positive attitude towards healthy food in six out of 10 questions. 91.7% felt that "the cafeteria should sell healthy food and beverages," whereas 89.6% of them felt they cared for their health. Meanwhile, 88.0% of the respondents strongly felt students should be taught about healthy food choices in higher education institutions" Respondents' choices related to snacks, fatty food foods, processed foods, candy, and chocolate were slightly neutral. Overall, most respondents had a positive attitude (mean=3.86) towards their health conditions and food choices.

Practice regarding food labels

More than half of the respondents paid attention to total calories (56.3%) and sugar content (55.7%) when choosing a food product. Compared to other nutrients on the food label, fat (49.5%) came third, as the macronutrient most likely observed compared to saturated fats (40.6%). In addition, 44.3% of respondents always looked at ingredients lists. Interestingly, 38.5% also looked at health claims. When asked about nutrients that influenced food choices, carbohydrates were reported as the most common

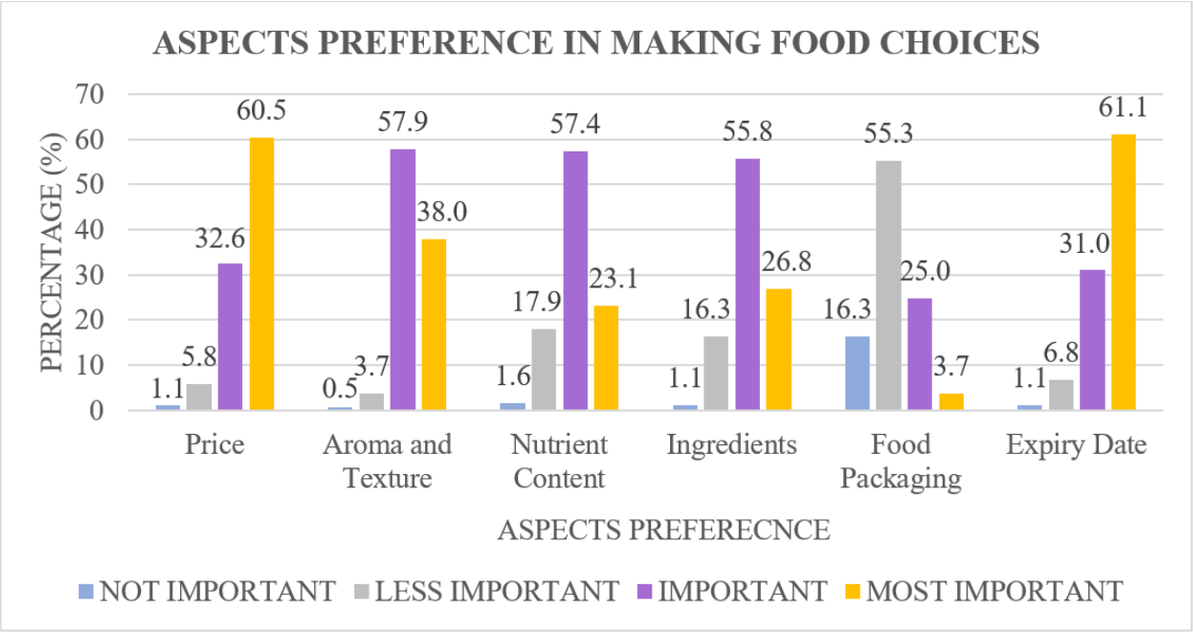

Figure 1 Percent of respondents based on aspects preference in making food choices

macronutrient (n=84; 43.8%). This was followed by fibre (n=76; 39.6%), serving size, and salt (n= 69; 35.9%). Only a small number of respondents reported looking at sugar content (n=18; 9.4%). The overall mean score of food labels usage was 3.11.

ASPECT AFFECTING FOOD CHOICE

As shown in Figure 1, most respondents (61.1%) choose the expiry date as an important factor influencing their food choice. This was followed by price (60.5%), aroma, texture and nutrient content (57.9%), and ingredients (55.8%). However, more than half of the respondents (55.3%) felt that food packaging was the least important aspect of their food choice.

CORRELATION BETWEEN KAP

Table 2 shows an association between KAP among 190 students in higher education institutions using nutrition food labels to make food choices. Based on the findings, there was no significant correlation between knowledge and attitude, $r_s = 0.137$, $p > 0.05$, and knowledge and practice, $r_s = 0.010$, $p>0.05$. However, there was a strong positive correlation between attitude and practice, $r_s = 0.281$, $p<0.001$, whereby the correlation is statistically significant.

Table 2 Correlation between knowledge, attitude, and perception on nutrition and food labels

Spearman's Rho Correlations	Knowledge		Attitude		Practice	
	r_s	*p*	r_s	*p*	r_s	*p*
Knowledge	1.000	-	0.137	*0.059*	0.010	*0.890*
Attitude	0.137	*0.059*	1.000	-	0.281	*0.001**
Practice	0.010	0.890	0.281	0.001*	1.000	-

*Statistical significance ($p < 0.05$)

Table 3 Multiple linear regression of KAP and sociodemographic data

	Knowledge		Attitude		Practice	
	Z [a] | H [b]	p	Z [a] | H [b]	p	Z [a] | H [b]	p
Age [a]	-0.172	0.863	-1.342	0.180	-0.943	0.346
Gender [a]	-2.115	0.034*	-1.611	0.107	-3.060	0.002*
Races [b]	2.014	0.569	0.489	0.921	2.096	0.553
Body Mass Index (BMI) [b]	1.091	0.779	3.596	0.309	0.264	0.967
Types of Institution [b]	0.570	0.752	1.808	0.405	0.368	0.832
Physical Activity Level [b]	0.912	0.823	10.641	0.014*	5.632	0.131
Current Education Level [b]	3.796	0.150	11.183	0.004*	5.330	0.070
Household Income [b]	6.814	0.235	5.439	0.365	14.975	0.010*

Statistically significant ($p < 0.05$)
[a] Mann-Whitney test
[b] Kruskal-Wallis test

CORRELATION BETWEEN KAP AND SOCIODEMOGRAPHIC DATA

There were significant relationships between KAP and sociodemographic data (Table 3). In terms of knowledge, there was a significant difference between gender in which males had higher knowledge scores than females (p=0.034). However, more females used food labels compared to males (p=0.002). When education level was compared with attitude, the findings indicated that the higher the education level, the better the health-belief-related attitude, and the difference was significant (p=0.004). In addition, there was a statistically significant correlation between physical activity level and attitude (p=0.015). Respondents with a moderate physical activity level had a better attitude based

on the highest mean rank (116.0). Respondents' practice was significantly affected by household income (p=0.010). Those with a household income between RM 5001 to RM 7001 and between RM 3001 to RM 5000 had better food choices.

DISCUSSION

In this study, 67.4% of the respondents had a normal BMI of 20.8 ± 0.23 kg/m^2, and the percentage of overweight and obese was 6.3% and 2.1%, respectively. Compared to previous studies on medical students in Malaysia, our findings were almost similar (Nor Afiah et al. 2014; Sugathan et al. 2014). However, compared to international students, our prevalence rate was much lower (Peltzer et al. 2014). Educational, geographical, and cultural differences may have influenced these differences, leading to different dietary practices.

Our findings showed that respondents have high nutrition knowledge with a total mean score of 8.92. Most of the knowledge-based questions were answered correctly by 90% of the respondents. Meanwhile, a slightly positive attitude was also observed among the respondents when it came to food selection. The positive outcome for both knowledge and attitude might be influenced by the respondent's educational background as a large number (90.5%) of the undergraduate students were from health sciences backgrounds. A KAP study on dietary knowledge demonstrated lower knowledge among students from social sciences and engineering backgrounds than those from exact natural sciences backgrounds (Alves et al. 2020). Another large KAP study among university students assessing food safety knowledge also reported insufficient knowledge in food safety. 70% of the respondents were from humanities and scientific backgrounds, and only 29% were from health backgrounds (Osaili et al. 2021). The limitation in this study is acknowledged, and a heterogeneous sample of students from social sciences and engineering backgrounds would have been ideal.

In this study, only the mean score was calculated, which was used to evaluate the respondents' knowledge level. Hence, perceived knowledge and accuracy knowledge can be used in a future study to identify the knowledge level (Dolatkhah et al. 2019).

Our study showed that 40.3% of the respondents always used the food labels, similar to a previous study which reported 36.5% of its respondents consistently using food labels during food selection (Christoph et al. 2016). There was also a difference in food label usage between gender as females used food labels more often than males. Similar findings were reported in several other studies (Bazhan et al. 2015; Christoph et al. 2016; Talagala et al. 2016). Many respondents paid attention to total calories (56.3%), sugar (55.7%), and fat content (49.5%) in a food label.

Besides nutrient content, respondents also paid attention to expiry date (61.1%) and price (60.5%). This is expected as most students do not have much time to shop and live on a tight budget. Most of the respondents (24.7%) had a household income of less than RM3000 influencing their purchases. However, food packaging (55.3%) was the least important factor influencing food choices. This was contrary to a previous study whereby attractive packaging positively influenced food purchases (Ma et al. 2020).

The current findings showed that a high knowledge level did not ensure good food labels usage when knowledge was correlated with practice. Our result was similar to previous studies by Norazlanshah et al. (2013) and Talagala et al. (2016), whereby there was no association between knowledge and the use of food labels. A good knowledge level did not indicate excellent practice in a balanced diet preference. Ghosh et al. (2020) as knowledge alone was insufficient for the respondents to use food labels when making food choices. Poor practices in using food labels may be influenced by behaviour and personal preference of brand and taste (Deliens et al. 2014; Viola et al. 2016). However, other studies have reported that those with higher educational background more likely to read food labels (Al-Barqi et al. 2020; Ambak et al. 2018; Bazhan et al. 2015) as knowledge is able to promote food label usage.

We found a correlation between attitude and use of food labels which was in line with previous studies (Lim et al. 2015), Norazlanshah et al. (2013), whereby a good attitude is associated with label usage when making food choices. However, several factors have been identified as barriers to using food labels. One study reported that small print of food labels (29.3%) was the main reason for not reading food labels, followed by no interest and difficulty understanding food labels (Bazhan et al. 2015). In addition, a previous study revealed that the most common reason for not reading food labels among students was related to time constraints, as most of the time was used in studying (Al-Barqi et al. 2020). These barriers need to be identified and addressed to promote food label usage.

In this study, several limitations were identified in correlating the knowledge, attitude, and food labels used among higher educational institution students. There was an absence of standardized instruments in assessing the food labels used. In addition, other potential factors such as psychological and environmental conditions that can affect the food labels used were not explored. Therefore, a more comprehensive and standardized measurement tool that undergo reliability test needed to be developed and

used in future assessments. As the respondents recruited were mainly focused in urban areas, Selangor and Kuala Lumpur, the findings were not strong enough to represent the entire population of high educational institution students. Hence, expansion in the recruitment area can be done in future studies. Overall, good knowledge and attitude toward healthy food selection were observed in the study.

CONCLUSION

Knowledge and a positive attitude towards healthy eating and food label may not influence practice as most respondents had poor practices in food labels utilization. Female students are more likely to use food labels. With regards to nutrition information panel on food labels, most respondents were concerned about the total calorie of the products compared to other macronutrients. Non nutritional factors influencing food choices were expiry date and price but not food packaging. It is crucial to increase awareness among the higher educational institution students to promote the utilization of food labels in making a healthier food choice.

DISCLOSURES

The authors declare that there is no conflict of interest.

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