Traffic light profiling of meals sold in cafeteria of local universities: A pilot study

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ABSTRACT

Unregulated university cafeterias may be serving food and beverages high in fat or sugar. Traffic light labelling (TLL) has been able to guide students in making healthier choices. Therefore, the aim of this study was to assess the healthiness level of food and beverages served in university cafeterias by profiling it against TLL and calorie density to evaluate student's perception towards the implementation of TLL. This pilot observational study was conducted in three universities; two public university and one private institution within Klang Valley. A total of 166 foods and beverages were analysed for calories, fat, saturated fat, sodium, and sugar by using a nutritional software, Nutritionist Pro [(TM)]. Analysed data for each food/beverage were further profiled into TLL and calorie density by using an excel spreadsheet. Food and beverages analysed were those sold in canteen and cafeterias combined those frequently consumed, reported in a food frequency questionnaire (FFQ). A total of 192 students completed a questionnaire containing three sections: personal profile, a short FFQ of their usual intake and their perception towards implementation of TLL in their institutions. 8.1% of all food items were categorised as green (healthy food), whereas 41.9% were amber (moderately healthy food), and 50% were red (unhealthy food). Almost half of the beverages (46.7%) were found to be unhealthy. However, when all foods were profiled for calorie density, more than half (61.8%) were categorised as moderately healthy food. In addition, most of the respondents (88%) showed a positive perception towards the implementation of TLL in the cafeteria. A large number of meals sold in two universities cafeterias were unhealthy and requires dietary modification. TLL implementation was beneficial for tertiary students as it may help guide the students to choose healthier options of cooked meals and packaged foods and beverages.

Keywords: *Traffic light labelling; cafeteria; student; university and pilot study*

INTRODUCTION

The prevalence of obesity and overweight among adults aged 18 and above has been steadily increasing for the past 4 years from 30% to 30.4% and 17.7% to 19.7% (NHMS 2015, 2019). A recent cross sectional survey among 1773 university students across five local universities showed that almost 17% of were obese and 21.7% were overweight (Wan Mohamed Radzi et al., 2019). This is a cause for great concern as obesity leads to several

chronic diseases such as diabetes (Akoumianakis & Antoniades, 2019), cardiovascular disease (Cercato & Fonseca, 2019), cancer (Colditz & Peterson, 2018) and osteoarthritis (Foo et al., 2020) impacting quality of life and increasing economic burden.

Excessive calorie intake mainly from carbohydrate and fat is associated with non-communicable diseases. Malaysian food balance sheet data over a period of 34 years (1980-2013) showed that total energy supply exceeded requirements in both adult females and males. Wheat, sugar, sweeteners, poultry, fish, and seafood were the main contributors to energy intakes among Malaysian (Von Goh et al., 2020). Meanwhile, intake of vegetables, fruit, and dairy consumption are insufficient among Malaysian adults (MANS, 2014).

A large number of the students living on campus typically have meals in a university cafeteria, which accounted for about 46.8% of university students from other various local universities (Akbara et al., 2021). Another study conducted by College & University Consumer Trend showed that 69% of university students purchased food and beverages from on-campus food services or cafeterias once a week or more (Smith et al., 2020). However, there is no local study regarding the frequency of students having their meals in campus cafeteria.

There are no large prospective studies assessing dietary intake among university students in Malaysia to date. Two studies from a local univeristy survey showed that fruit and vegetables intake among students are lower compared to recommended intakes (Sundaram et al., 2018; Teoh et al., 2021). A dietary intake survey among 100 Universiti Kebangsaan Malaysia (UKM) students living in residential colleges reported that although more that 50% students met the micronutrient intake recommendation; 35-57% of them still consumed high calorie and high fat foods (Omar et al., 2015). However, another survey reported that more than 50% of 584 students did not meet the recommendations for energy and micronutrients, particularly female students (Gan et al., 2011). In addition, two studies reported that students frequently skipped breakfast and preferred snacks such as local desserts (kuih), candies, chocolates and biscuits. Although fruit was also consumed as snack the frequency was much lower compared to other high calorie snacks (Gan et al., 2011; Sundaram et al., 2018). Excessive calorie intake and a sedentary lifestyle are the most significant factors in one being overweight or obese. It is a great concern that these students have an imbalanced diet. It is uncertain if this is related to their food choices of students or if the university food environment is dominated by unhealthy food choices.

Nutrition food label use has been demonstrated to assist people in selecting healthier food choices. In Malaysia, food labels are required to have mandatory nutrient in their nutrition information panel such as total calories per 100g/100ml, total calories per serving, total carbohydrate, total sugar, total protein and fat. Other nutrients which are optional include types of fat, fibre, vitamins and minerals (Ministry of Health, 2007). Given that not all the university students will have high nutrition knowledge level (Norazlanshah et al., 2013), it is unsure if food labels are suitable to guide students to choose healthier options. A questionnaire-based survey on meal selection on 580 students reported that most students were aware of healthy meals but paid less attention to nutritional content (Mansor et al., 2016).

TLL has been demonstrated to be effective for promoting healthier choices among individuals (Anne N Thorndike et al., 2014). It has shown to guide consumers to choose healthier items at the point of purchase thus reducing obesity (Sonnenberg et al., 2013). Consumers can also identify healthier items with TLL compared to monochromatic labelling systems (Hawley et al., 2013) which are formatted in black and white. However only a few studies had profiled menus based on Traffic Light Labelling (TLL) in university cafeterias to measure the relative healthiness of cafeteria food items (Martin & Vollmer, 2021; Sonnenberg et al., 2013; Zagone, 2021) and there have no studies in Malaysia.

Therefore, this pilot study aimed to profile food and beverages sold in two universities cafeterias based on TLL and calorie density and assess student's perception towards implementation of TLL on campuses.

METHODOLOGY
Study design

This cross-sectional pilot study was conducted from October 2020 to June 2021 involving university students from two public and one private institution. These universities were selected as they were part of a research collaboration. The study's primary aim was to profile food and beverages sold in university canteen and cafeterias against TLL to determine the level of healthiness. A total of 166 food and beverages sold in both institutions were included in the analysis and 192 students had completed the online questionnaire. A consent form was given to the respondents before data collection for self-administered questionnaires. Meanwhile, verbal consent was obtained from canteen operators to profile their onsite menu. Respondents were anonymised to ensure confidentiality.

Respondents and recruitment

The respondents were students from two universities, and one private institution within Klang Valley. Survey Monkey (https://www.surveymonkey.com/) was used to administer the questionnaire. A convenience sampling method was utilised for recruitment. Snowballing technique was used whereby those participating passed on the survey details to their course mates. The study was also advertised through social media pages (e.g., Facebook and

Instagram). The inclusion criteria were Malaysian students of 18 years and above of age, currently studying in higher educational institutions such as polytechnics, colleges, or universities and those who were able to read and understand either English or Malay. The exclusion criteria were first year students who had not been to the campus at all throughout their semester.

Sample size calculation

The sample size of the study was calculated by using formula Cochran (1963).

$$n = \frac{(Z_{a/2})^2 \, p \, (1-p)}{e^2}$$

A study with unknown variability of proportion in adaptation of the practices was suggested to use 50% for the expected proportion in population to get the maximum variability with reference to Israel (2003). Hence, p=0.05 was used in the calculation while the confidence level used was 95% and margin of error used was 7%. The respondents required to participate in this study were 236 in total after taking 20% of the dropout factor into consideration.

Questionnaires

The questionnaire had a total of three sections with the first section on personal profile containing 10 questions which also included self-reported weight and height and physical activity.

The next section was a food frequency questionnaire to assess the type and frequency of food and beverages consumed at canteen or cafeteria. This questionnaire was adapted and modified from a validated questionnaire (MANS, 2014) and other studies assessing dietary intake among university students and Malaysian adults (Cheng & Kamil, 2020; Gan et al., 2011; Hakim et al., 2012; Norimah Jr et al., 2008) The row of the FFQ row was divided into 15 sections and listed fruits (fresh, dried and pickled), vegetables (cooked or raw), beverages (canned/packaged or freshly prepared), milk and milk products, bread and pastry (bread, pizza, pancakes, naan, chapati), a' la carte meals (porridge, rice with meat/chicken or fish, fried noodles or noodles with soups), plain soups (mushroom, pumpkin, tomyam), individual dishes (containing meat , poultry, egg, fish, seafood or vegetable) as well as sweet and savoury snacks both packaged or made fresh (banana fritters, apam cake, muffin, apple pie etc). Meanwhile the column was divided into four sections: everyday, 3-5 days/week, 1-2 days/week and < 1 day/week.

The final section contained three questions assessing perception towards implementation of TLL in their respective universities. The questions were adopted from the questionnaire from the previous study (M. Seward et al., 2018). Respondents had to choose a yes or no or not sure answer for three statements. The statements were whether they agreed with the implementation of TLL in their university, if TLL guided them in making healthy food choices and if they think TLL is suitable to be implemented in their setting.

The questionnaire go through face and content validity. Face validity piloted among 20 students. Students rated the questions based on accuracy, simplicity and clarity. The feedback from the students was collected for improvement. This questionnaire also go through content validity indexing techniques to evaluate the content, context and criterion relevance (Liu et al., 2011). Five experts including one dietitian , three dietetic lecturers, and one public health expert evaluated the questionnaire for content validity. They went through selection of questions based on grammatical accuracy and interpretability. The evaluation were based on a four-point Likert scale which the scoring was as follows: 1 = not relevant, 2 = somewhat relevant 3 = relevant and 4 = highly relevant (Yusoff, 2019). The content validity of the initial questionnaire was assessed using the item-level content validity index (I-CVI) and all the 14 items with an I-CVI value of ≥ 0.78 were retained while one item with an CVI of ≤ 0.70 was excluded. After the I-CVI calculation, the scale-level content validity index (S-CVI) was analysed using both the average method (S-CVI/Ave) and the universal agreement method (S-CVI/UA). The value obtained from the average method was 0.91 which indicated the items were acceptable as the lower limit of acceptability for S-CVI was 0.8. However, the value from the universal agreement method was 0.67 which showed that the CVI of the items was not adequate for using the S-CVI/UA method. Hence, the S-CVI/Ave approch was used (Polit et al., 2007). In addition, the expert panel's recommendations were taken into consideration in revisng some of the wording and paraphrasing of items.

Measures
Calorie and nutrient analysis of food and beverages

There were a total of 166 food and beverages analysed for total fat, saturated fat, sugar and sodium. This was based on a one week meal cycle at both universities due to movement restriction order. The remaining items were

added from the list from canteen operators. These two universities were mainly used as this was a pilot project. The other food and beverages were based on the food frequency questionnaire (FFQ) completed by the 192

students. Only 15 types of the most frequently consumed food and beverages were included in the analysis. The foods and beverages added from the food frequency questionnaire (FFQ) were selected when food and beverage was chosen by more than half of the respondents. As the profiling was based on TLL labelling, only calories, total fat, saturated fat, sodium and sugar were measured for all food and beverages per 100 g or 100 ml by using nutritional software, Nutritionist Pro (Axxya Systems, 2006) These four nutrients were assessed because it is frequently found in processed food (Kunz et al., 2020). The Malaysian Food Composition table was selected in the software for the analysis. When a food item was not available other databases were used to find similar foods. For composite dishes that were not available in any databases, new foods were created. This was done by entering ingredients from local recipes obtained through popular Malaysian recipes online (www. kuali.com and www. rasamalaysia.com).

All food and beverages were subdivided into a few categories for ease of analysis (Webb et al., 2011). Food items were classified into three categories which were dishes, a la carte and snacks (Table 1).

Table 1: Categorisation of food and beverages sold in canteen and cafeterias.

Category	Examples
Dishes	Beef curry, fish cooked in coconut milk and stir-fried cabbage
A la carte	*Paprik* fried rice, mee curry and aglio olio spaghetti
Snacks	Curry puff, corn dog, *kuih* and waffle
Beverages	Coffee, tea, Milo and orange juice

Traffic Light Labelling profile

Food and drink items were categorised into three colour-coded categories: green colour indicating healthy food, amber for moderately healthy food, and red for unhealthy food (Chen et al., 2017) based on the TLL cut-off points for food (Table 2) and beverages (Table 3). The TLL cut-offs used in profiling were from the United Kingdom Food Standard Agency (UK FSA) which was modified based on the Malaysian Dietary Guidelines 2010.

Table 2: Cut-Offs used for traffic light labels for a usual food serving or food based on Malaysian Dietary Guidelines 2010.

INDICATION	MDG DAILY REFERENCE (2000 kcal diet)	TRAFFIC LIGHT LABELLING		
		LOW	MODERATE	HIGH
Colour Code	-	Green (g/100g)	Amber (g/100g)	Red (g/100g)
Fat	45g - 67g	≤3.0	3.0 - 17.5	> 17.5
Saturated Fat	< 22g	≤1.5	1.5 - 5.0	> 5.0
Sugar	< 50g	≤5.0	5.0 - 22.5	> 22.5
Sodium	< 2300mg/day	≤0.12	0.12 - 0.48	> 0.48

Table 3: Cut-Offs used for traffic light labels for a usual beverage serving based on Malaysian Dietary Guidelines 2010.

INDICATION	MDG DAILY REFERENCE (2000 kcal diet)	TRAFFIC LIGHT LABELLING		
		LOW	MODERATE	HIGH
Colour Code	-	Green (g/100ml)	Amber (g/100ml)	Red (g/100ml)
Fat	45g - 67g	≤1.5	1.5 - 8.75	> 8.75
Saturated Fat	< 22g	≤0.75	0.75 - 2.5	> 2.5
Sugar	< 50g	≤2.5	2.5 - 11.25	> 11.25
Sodium	< 2300mg/day	≤0.06	0.06 - 0.24	> 0.24

The cut-off point for TLL was calculated based on the formula of the previous study by Babio et al., (2014). It was then standardized using a country-specific recommendation similar to Guideline Daily Amount (GDA). Table 2 shows the cut off points of fat, saturated fat, sodium, and sugar for food items using the Malaysian Dietary Guidelines (MDG) 2010 were used as a reference. All meals and beverages sold in cafeterias were then profiled

using the adapted TLL cut-offs.

Additionally, foods were also categorised based on calorie density. Calorie density (kcal/g) was calculated using the calorie density formula for each of the food items and beverages collected in the survey to cafeterias and reported from the food frequency questionnaire (FFQ). Food items and beverages were then categorized into three categories of calorie density. The formula used to calculate the calorie density as below (Pérez-Escamilla et al., 2012).

$$Calorie\ Density = \frac{Calorie\ per\ serving\ (kcal)}{Gram\ per\ serving\ (g)}$$

The categories were high-calorie density (>4.0 kcal/g), medium-calorie density (1.5 - 3.9 kcal/g), and low-calorie density (<1.5 kcal/g) (Rolls, 2017). The calorie density also used the same colours as TLL (Vernarelli et al., 2018). The red colour represents high-calorie density; amber represents medium-calorie density and green represents low-calorie density. The number of calories for each food item and beverage was calculated and evaluated using nutritional analysis software (Axxya Systems, 2006).

Statistical analysis

Statistical Package for the Social Science (SPSS) version 25.0 was used for analysis and reported as mean and standard deviation (SD). All of the categorical data were expressed in numbers and percentages.

RESULTS
Respondents' responses
Personal characteristics of respondents

A total of 192 students completed the study. The personal characteristic of the respondents is presented in Table 4. A vast majority of the respondents (97.4%) were between the ages of 20-29 and they were mainly female (83.3%) of Chinese ethnicity (71.3%). The mean BMI of the respondents were (20.8kg/m^2 ± 0.23) and more than half of them (53.1%) had a low level of physical activity. With regards to household income, a quarter of the respondents had a household income of less than RM 3000.00 per month.

Respondents' perception towards implementation of TLL

Table 5 shows the respondent's perception towards TLL implementation in their cafeterias. A majority of the students (88%) agreed with TLL implementation in cafeterias, and 94.8% felt that TLL is suitable to be used in university cafeterias. Meanwhile, 94.3% felt that TLL were able to guide them in making healthy food choices.

Table 5: Respondents' perception towards implementation of TLL.

STATEMENT		N (%)
I agree with the implementation of the traffic light labelling in the cafeteria.	Yes	169 (88.0)
	No	4 (2.1)
	Not sure	19 (9.9)
Traffic light labelling helps in making healthy food choices.	Yes	181 (94.3)
	No	2 (1.0)
	Not sure	9 (4.7)
Traffic light labelling is suitable to be used in universities cafeterias.	Yes	182 (94.8)
	No	0 (0.0)
	Not sure	10 (8.2)

Food and beverages profiling
Traffic light profiling of food items based on nutrient content

A total of 166, food and beverages were analysed and profiled against TLL. The TLL profiling was based on colours. Green indicated healthy option; amber was considered moderately health whereas red was unhealthy. Only 8.1% of all the food items were green. Meanwhile the remaining foods items were categorised as red (50%) and amber (41.9%). Amongst these food items, there were 40 types of dishes, 53 types of *ala carte meals*, 43 types of snacks and 30 types of beverages. Of these, one fifth of cooked dishes (19.1%) and snacks (20.6%) were profiled as red. Meanwhile, more than one fifth of the a' la carte meals were amber (22.7%.) (Figure 1).
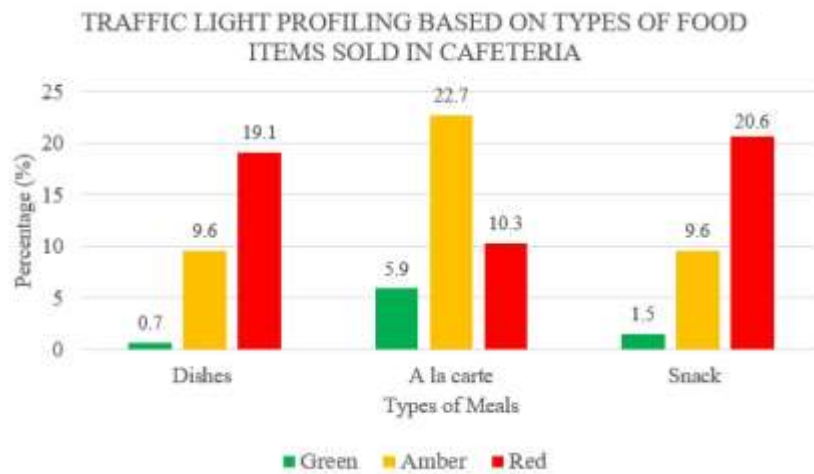
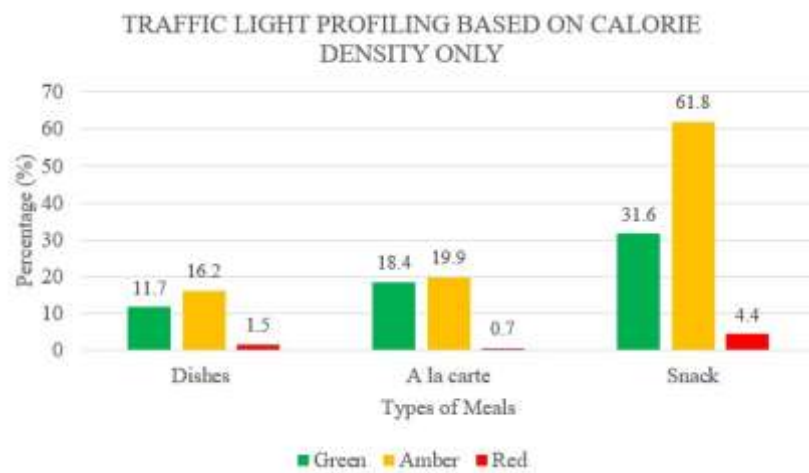**Figure 1:** Traffic light profiling based on types of food items sold in the cafeteria.

Figure 2: Traffic light profiling for different meals sold in the cafeteria based on calorie density.

Traffic light profiling of food items based on calorie density

Contrarily, when assessed for calorie density, 61.8% of food items were categorised as amber, followed by 31.6%, green, and only 6.6% red. More than half (61.8%) of the snacks were moderately dense in calories. Only a small number of snacks, (4.4%), dishes (1.5%) and a la carte meals (0.7%) were red.

Traffic light profiling for beverages

Almost half of the beverages sold, (46.7%) were red and contained only sugar and only one third of the beverages were green (30%). Amongst these beverages, *air limau nipis* was found to have the highest amount of sugar. Figure 3 shows the traffic light profiling for all 30 types of beverages analysed and profiled.
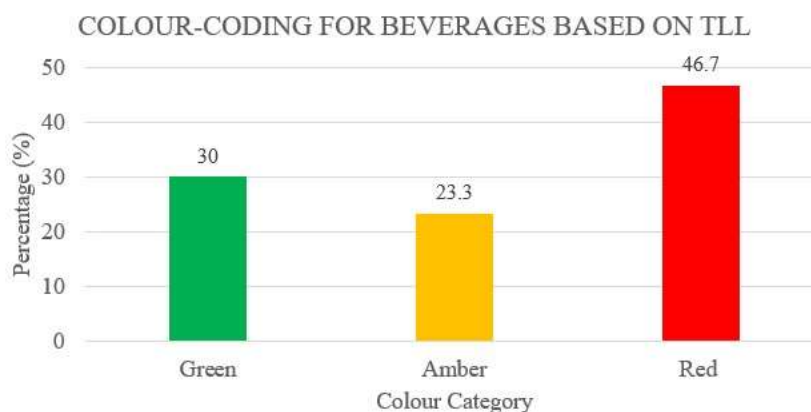

Figure 3: Traffic light profiling for all drink items sold in the cafeteria.

Table 4: Personal characteristics of respondents.

CHARACTERISTIC		RESPONDENTS (n=192)
		N (%)
Age Group	18 – 19	3 (1.6)
	20 – 29	187 (97.4)
	30 -39	2 (1.0)
Gender	Male	32 (16.7)
	Female	160 (83.3)
Ethnicity	Malay	35 (18.2)
	Chinese	137 (71.3)
	Indian	8 (4.2)
	Other	12 (6.3)
Body Mass Index (BMI)	Underweight (<18.5 kg/m^2)	46 (24.0)
	Normal (18.5 - 24.9 kg/m^2)	130 (67.7)
	Overweight (25.0 – 29.9 kg/m^2)	12 (6.3)
	Obese (>30.0 kg/m^2)	4 (2.0)
Types of Institution	Private University	109 (56.8)
	Public University	63 (32.8)
	College	20 (10.4)
Physical Activity Level	Sedentary	43 (22.4)
	Low	102 (53.1)
	Moderate	40 (20.8)
	High	7 (3.7)
Current Education Level	STPM/Matriculation/Diploma	17 (8.9)
	Degree	172 (89.6)
	Master	1 (0.5)
	PHD	2 (1.0)
Household Income	< RM 3000	47 (24.5)
	RM 3001 – RM 5000	36 (18.8)
	RM 5001 – RM 7000	16 (8.3)
	RM 7001 – RM 9000	15 (7.8)
	> RM 9000	30 (15.6)
	Prefer not to say	48 (25.0)

DISCUSSION

Although there have been been several studies assessing the food environment in the universities, this is the first study to profile cooked foods in a Malaysian setting against the TLL and to assess the perception of university students towards implementation of TLL. The profiling of food and beverages showed that almost 50% of food and beverages sold in the canteen were profiled as red or unhealthy. Foods which were labeled red were mainly high in fat, saturated fat, and sodium. Protein foods such as meat or seafood were more likely to have natural saturated fat in them (RNI, 2017). Meanwhile, other foods had a high-fat content due to the cooking process i.e frying and fat added to them i.e dishes made with coconut milk. Food made with stock cubes such as soups and rice dishes were high in sodium. Meanwhile, snacks, local cakes (kuih), and beverages (fresh juices, malt drink) contained a high amount of added sugar.

There are currently no studies to compare our findings as most of the studies on TLL food environment assessed food choices of consumers at point of purchase before and after implementation of TLL (Chen et al., 2017; M. W. Seward et al., 2016; Anne N. Thorndike et al., 2019; Whitt et al., 2018). However, a cross-sectional assessing the dietary intake of 360 adults in a public Malaysian University found that most respondents consumed energy dense foods such as cereals (rice dishes) (43.9%), confectionaries (11.1%), drinks (10.89%), meat and meat dishes (10.89%). In addition, local cakes (kuih) and biscuits were also in the most commonly consumed foods as well as sugary beverages (Fokeena et al., 2015). Our findings showed that almost 20% of both snacks and dishes and around 50% of beverages sold were unhealthy. Based on the results from study of Swetaa et al., (2018), the students had poor healthy eating practices even they are aware of the balanced diet. They tend to purchase fast food and junk food during their break time. A recent modelling study among 20,000 Canadians, suggested that TLL could be implemented to improve non-communicable diseases outcome in Canada. Investigators profiled dietary data from a population survey against TLL and found that avoiding red food could potentially prevent mortality related to cardiovascular disease (Labonté et al., 2019). Therefore, TLL profiling is very much needed to guide students to choose healthier food options.

When foods were categorised based on calorie density, a large proportion was amber (61.8%) and almost a third of them were green (31.6%) despite some of these foods being profiled as red using the TLL criteria. This observation showed that moderately calorie-dense food can still be unhealthy and justifies that TLL is a better method to assess the healthiness of a food item as it gives a breakdown of a nutrient profile of a food or beverage.

In summary, this study demonstrated that TLL was useful in assessing the healthiness level of food and beverages as compared to previous studies (Chen et al., 2017; Anne N. Thorndike et al., 2019). TLL or multiple traffic light is nutrient specific and profiles food based on only four nutrients i.e total fat, saturated fat, sodium and sugar. It was intended to guide consumers to make quick food choices when purchasing packaged foods. However, this has also recently been adapted and used in various settings such as schools, tertiary institutions, and hospital cafeterias to profile cooked foods. One longitudinal study assessed food items based on cafeteria purchases labeled items in the cafeteria based on positive criteria or negative criteria. The positive criteria contained foods served with a fruit/vegetable, whole grain, and lean protein. Meanwhile, the negative criteria were only based on saturated fat and caloric content (Anne N Thorndike et al., 2014). Another study on a worksite canteen profiled their foods at their worker's canteen by using TLL together with the degree of food processing i.e cooking methods (Chen et al., 2017). Most recently, text statements appearing next to the TLL colors have also been used (Temple, 2020). As the focus of this study was to mainly profile the types of food and beverages sold at the cafeteria/canteen a more basic profile was used and calorie density was also assessed. However, this can be adapted for future studies to investigate the efficacy of TLL implementation in a university setting.

As TLL is not mandatory in Malaysia, it is important to also assess the perception of students towards the implementation of TLL in their institutions. A large number of students felt TLL is suitable for their food environment and that it will guide them to make healthier food choices. As TLL does not require a high level of literacy, implementation will be useful for not only students but also university staff and the general public.

LIMITATIONS

As this was a pilot study only a small quantity of food and beverages were profiled against TLL. Although the point of purchase data has been used by other studies this may not be appropriate for our setting as most transactions are still done by cash. Standard recipes were also not available although these had been requested from canteen operators. Personal communication between a few other canteen operators in both schools and universities indicates that they do not use a standard recipe in their day-to-day food preparation. However, nutrient information was manually keyed in for composite dishes based on recipes from credible websites as previously done in other studies (Min et al., 2017). In addition, weighing of food and beverages could not be done as researchers could not gain access to the canteens or cafeterias. Therefore, this may have led to the under or overestimation of the nutrient content of both food and beverages.

CONCLUSION

TLL profiling demonstrated that almost 50% of food and beverages sold in the canteen or cafeterias were unhealthy. Most of the students would like TLL to be implemented to guide them to choose healthier food options and this may be possible when more healthier food options are made available.

AUTHOR CONTRIBUTIONS

Conceptualization and methodology: Shanthi Krishnasamy, Loo Shi Yee, Anis Wahida Md Nazri, Nur Eizzati Farhani Rosle.; Data curation: Loo Shi Yee, Anis Wahida Md Nazri and and Nur Eizzati Farhani Rosle.; Piloting of questionnaire: Loo Shi Yee, Anis Wahida Md Nazri, Nur Eizzati Farhani Rosle and Lee Yi Yi.; Writing, review and editing: Loo Shi Yee, Anis Wahida Md Nazri, Nur Eizzati Farhani Rosle, Munirah Ismail, Lee Yi Yi and Shanthi Krishnasamy. All authors have read and agreed to the published version of the manuscript.

ETHICS APPROVAL

Ethical approval was obtained from the Medical Research Ethics Committee of the Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2021-267).

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CONFLICT OF INTEREST

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