ORIGINAL ARTICLE

Development and Validation of FFQ for Assessing Sugar-Sweetened Beverages (SSB) and High-Energy Dense Foods Intake among Malaysian Adolescents

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ABSTRACT

Introduction: Increased consumption of sugar-sweetened beverages (SSBs) is strongly associated with weight gain, dental cavities, and a higher risk of chronic diseases among adolescents. However, there is no available FFQ for the Malaysian population individually to evaluate and assess the consumption of SSBs and high-energy dense (HED) foods among adolescents. **Method:** A 24-hour diet recall with 30 adolescents were performed via Google Meet to identify the most common and frequent types of SSBs and HEDs foods consumed nowadays. The food checklist of SSBs and HED foods from literature review search was also provided to the participants. Experts critically reviewed each food item and provide a score for its relevancy and essentiality. Face validity were conducted among 10 adolescents to validate the developed FFQ. **Results:** The final FFQ consisted of 63 food items with ten categories. This FFQ showed high content validity for individual items with I-CVI ranging from 0.67 to 1.00 and overall questionnaires with S-CVI/Ave valued at 0.97. The calculation of Kappa statistic showed that this newly developed FFQ has excellent inter-rater reliability at the item level with K > 0.74 for 55 items and K = 0.57 only for 4 items. Most of the items were marked as relevant with a CVR score of 1.00. **Conclusion:** The findings of this study imply that the newly developed FFQ could be utilised to estimate the intake of SSB and HED foods of Malaysian adolescents.
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Keywords: Food Frequency Questionnaire, Sugar-sweetened Beverages, High Energy-Dense, Adolescents

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INTRODUCTION

Adolescence is a crucial stage of life where it marks the transition from childhood to adulthood. Biological, psychological, physical, and behavioural functions such as eating behaviour, physical activity, psychological wellbeing, physical fitness, and body composition are all altered and evolved during this phase (2). Research proved that obesity, cardiovascular disease, type 2 diabetes, and various malignancies have all been linked to bad eating habits and inactive lifestyles adopted during childhood, adolescence, and adulthood (1). Over the last few years, the obesity rate among Malaysians is worrying. The Institute for Public Health (2017), reported that 44% of Malaysian teenagers are overweight, with 14% being obese. In another survey conducted by the United Nations International Children's Emergency Fund, UNICEF (2019), 12.7% of Malaysian children aged 5 to 19 are obese. The high prevalence of overweight and obesity among teenagers should be highlighted as one of the most pressing health concerns since overweight and obesity in adolescence tends to persist into adulthood (26).

It has been discovered that the eating habits of children and adolescents are linked to their social and physical environment characteristics (29). Children and teenagers prefer to consume readily available and easily accessible foods, and they are more likely to consume larger amounts when bigger food portions are prepared (29). Adolescents' dietary behaviours have shown negative longitudinal and secular trends, such as an adverse shift in dietary habits and a decline in quality of diet during the transition from childhood to adolescence, with declines in consumption of vegetables, fruits, milk, fruit juice, and a rise in sugar-sweetened beverages (SSBs) intake (18). Fast food and high energy-density foods have become key contributors to obesity and overweight, raising public health concerns about the

dietary transition and the development of chronic non-communicable diseases (39). Because SSBs have empty calories, diminish satiety, and encourage the intake of foods with little to no nutritional value, there is rising worry about their impact on health (41).

There is substantial evidence that a high intake of SSBs and HED foods increases the risk of non-communicable diseases (15, 40). High consumption of high energy-dense (HED) food such as ultra-processed foods was linked to a higher prevalence of metabolic syndrome in adolescents (32). Besides, recent evidence suggests that consuming more fast food and having easier access to fast food may result in higher insulin levels and an increased risk of insulin resistance (42, 43). Excessive intake of SSBs and HED foods may lead to overweight, obesity or weight gain. High consumption of energy-dense food products such as SSBs, ready-to-eat meals, and savoury snacks, has been linked to overweight and obesity in adolescents and adults (44). Based on one Taiwanese study, SSBs intake was related to a 3.2-to-4.9-fold risk of obesity (45).

A 24-hour dietary recall, food record, and Food Frequency Questionnaire (FFQ) are the most common dietary methods used in assessing dietary intakes. However, these existing methods have a few limitations such as a 24-hour dietary recall or food record system for a large observational study was deemed impractical due to feasibility issues, and costs associated with scheduling, interviewer or respondent training, and data coding (24). In addition, both food records and 24-hour dietary recall were focused only on short-term intake. FFQ is a list of food items with response categories that reflect the usual frequency of consumption over some time (9).

As the prevalence of overweight and obesity among adolescents continues to increase, FFQ has been recognized as a method to study the intake of adolescents although it has not been used widely in Malaysian adolescent research (23). In epidemiological research, adolescents' food intake is frequently measured using the FFQ, which was initially created for adults (21). This FFQ's food list for adolescents was developed using a data-driven methodology. As a result, this FFQ is more likely to provide nutritional data representative of Malaysian adolescents. An FFQ has been developed and validated to estimate SSBs intake among Malaysian adults (19), however, the same FFQ may not apply correctly to the Malaysian adolescents given the fact that cultural differences, food accessibility, preference and socioeconomic background may appear between settings. Given all these concerns stated, it is an urge to develop effective evaluation tools for both habitual SSB and HED foods consumption so that intervention can be easily aimed in the future to improve SSB and HED foods intake. Therefore, the present study aims to develop and validate an FFQ to measure both SSB and

HED foods intake among Malaysian adolescents, using the correct definition for both foods mentioned.

MATERIALS AND METHODS

Sample design

A cross-sectional study was conducted involving adolescents aged 13 to 18 years old in Kelantan, Malaysia, who are proficient in Bahasa Melayu. On the other hand, adolescents who had chronic or terminal diseases (such as asthma, diabetes, hypertension, cancer, etc.) or require special dietary needs or special dietary requirements are excluded from this study. In this study, purposive sampling was utilized to select the participants. This non-probabilistic sampling technique involves the researcher's judgment in selecting individuals or groups that can provide rich and diverse information related to the research question (35). Unlike probability sampling, purposive sampling does not rely on statistical formula to determine sample size. Instead, the sample size is determined based on the anticipated heterogeneity of the target population, including areas, population groupings, geographic locations, households, and individuals. In this study, 30 adolescents were purposively selected to participate, based on their relevance to the research objectives.

To ensure the validity of the developed Food Frequency Questionnaire (FFQ), expert panels comprising healthcare professionals, including dietitians, clinical instructors, and food and nutrition experts were invited to evaluate and validate the instrument. While there is no consensus on the minimum number of experts required for content validation, most recommendations suggest at least six experts to ensure adequate representation of various perspectives and expertise (60). The number of experts included in this study was based on their availability and willingness to participate, as well as their expertise and relevance to the study objectives.

Instrument and Procedures

24-hour diet recall

To develop the Food Frequency Questionnaire (FFQ), foods and beverages that contributed to the participants' dietary intake were identified, and the required number of items to be included in the FFQ was determined. Participants were interviewed individually via Google Meet to complete a 24-hour dietary recall, as this method has been shown to yield a high response rate. During the interview, detailed information on all foods and beverages consumed by the participants was recorded, including the method of preparation, the brand of items used, and the time of consumption. Each food and beverage item reported by the participants was then analyzed and included in the FFQ as appropriate.

Food checklist

In addition to the dietary recall data, participants were

also provided with a food checklist comprising sugar-sweetened beverages (SSBs) and high-energy-dense (HED) foods that was developed based on the literature review search. Besides, the participants were given photographs of household utensils to measure the amounts of foods and beverages that they consumed. Thus, the portion size for food and beverages reported by them was based on local household units or according to the common commercial size unit. The frequency of intake for each food item in the food checklist includes, never, 1-3 times per month, once a week, 2-3 times a week, 4-6 times a week, once a day, 2-3 times a day, and more than 4 times a day, which were also adapted from literature review search. Participants were also asked to list down other SSBs and HEDs foods that were not listed in the food checklist. The food items that were commonly consumed by the participants were derived to form an FFQ.

Content Validation
To validate the newly developed Food Frequency Questionnaire (FFQ), experts were invited to critically review each food item included in the Content Validation Form (27, 60) and provide a score for its relevance and essentiality using a Likert scale. The relevance scale ranged from 1 (not relevant) to 4 (very relevant), and the content was deemed invalid if the rating was 1 or 2, while a rating of 3 or 4 indicated validity (27). Similarly, the essentiality scale ranged from 1 (not essential) to 3 (essential). Based on the feedback from the experts, changes were made regarding the removal or addition of items to ensure the content validity of the FFQ.

The I-CVI was calculated by dividing the number of experts who gave each item a "quite relevant" and "very relevant" ratings by the total number of experts. I-CVI was determined using the equation below.

$$Icvi = n_a/N$$

Where $Icvi$ is the Item-Content Validity Index, n_a is the number of experts who gave rates of 3 (quite relevant) and 4 (very relevant) for each item, and N is the total number of experts panels. For 6 expert panels, acceptable CVI values were at least 0.83, however, items having an I-CVI score of less than 0.83 should be revised based on expert feedback (25). The SCVI is the proportion of elements in an instrument that were determined to be content valid. The SCVI/Ave method computes the ICVI for each item in the instrument and calculated its average across the items. If the SCVI/Ave scores ≥ 0.9, the instrument will have excellent content validity (10).

Although CVI is often used to measure content validity, it has been suggested that due to chance agreement, this index does not account for the potential of in flatted values, thus, a kappa statistic is calculated in addition to CVI (36). The degree of agreement beyond chance is determined by the Kappa statistic, which can be calculated using the following formula:

$$K = \frac{Icvi - Pc}{1 - Pc} \text{ where } Pc = \left[\frac{N!}{A!(N-A)!} \right] 5^N$$

In this formula, Pc is the probability of chance agreement while A is the number of experts who agreed on which item is relevant. Kappa values more than 0.74 were considered excellent, 0.60 to 0.74 were considered good, 0.40 to 0.59 were considered fair, and smaller than 0.40 were considered poor (36).

The CVR was determined by the level of agreement for each item's inclusion through each expert who gave a rating of 3 (essential). The following equation was used to calculate the CVR value.

$$CVR = \frac{N_e - \left(\frac{N}{2} \right)}{\left(\frac{N}{2} \right)}$$

Where N_e is the number of expert panels indicating the item as "essential" and N was the total of expert panels. The CVR for the items designated as not essential was < 0.99, based on the total number of experts, N = 6, and the numerical values of the Lawshe table (14). Therefore, if the items are marked as nonessential, they should either be refined or removed from the instrument entirely.

Face Validation
The developed FFQ then validated by ten adolescents for face validity. The process was done face-to-face with them. The questions and time taken to complete the FFQ were noted down.

Data collection and analysis
Following consent from the parents of the selected adolescents to participate in the study, demographic data, food checklists, and 24-hour dietary recall data were collected. Content validation of the newly developed Food Frequency Questionnaire (FFQ) involved experts who were provided with a Content Validation Form (27, 60) via email, following their agreement to participate in the research.

Ethical clearance
Ethical approval has been obtained from the UiTM ethics committee prior to this study. The reference number is REC/09/2021 (UG/MR/828).

RESULTS

Subjects
A total of 30 adolescents participated in this study aged from 13 years old to 17 years old (15.87 ± 1.31). Female made up 90% of the respondents and all of the respondents were Malays. The majority of them were staying at the hostel and only 23.3% received a monthly allowance of less than RM200.

Development of a food list

The development of this FFQ resulted in the classification of 59 food items into ten categories of SSBs and HED foods based on literature review and 24-hour diet recall. The first five categories of this food list comprised of SSBs whilst the rest was composed of HED foods including biscuits, cake and bread, chocolate, fast foods, and confectionery. Food items of this FFQ consisted of nine fruit juices and drinks, six sweetened milk and cultured milk drinks, three carbonated beverages, followed by three sweetened chocolate malt, tea, and coffee, 12 vendor-made or home-prepared drinks, seven biscuits, cake, and bread, four chocolate, nine fast foods, and six confectioneries. All food groups and food items were presented as shown in Table I.

Table I: Number of items selected for the development of FFQ

Item groups	Items	No. of items
Fruit juice & drinks	"apple drink", "orange drink", "blackcurrant drink", "soy drink", "mango drink", "lychee drink", "iced lemon tea", "chrysanthemum", "various cordial drink – Ribena, Sanquick"	9
Sweetened milk & cultured milk drinks	"strawberry flavoured", "fresh milk", "chocolate flavoured", "full cream", "yogurt drink-Calpis, bliss", "yogurt"	6
Carbonated beverages	"cola", "orange", "isotonic drinks-100plus, Revive, 7up"	3
Sweetened chocolate malt, tea, & coffee	"malted drink-milo, Horlicks", "ready to drink coffee-Wonda, Nescafe, Starbucks, Farm Fresh", "ready to drink tea-Yeos, Pokka, Oishi, Lipton"	3
Vendor-made or home-prepared drinks	"*bandung*", "*jagung*", "iced chocolate", "lychee in syrup", "iced tea", "iced milk tea", "pearl milk tea", "ABC", "hot tea", "iced blend", "pre-mixed drinks-Oldtown, Nescafe, Essenso, Nestum", "coffee drinks-cappuccino, mocha, latte"	12
Biscuits, cake & bread	"chocolate chips-chipsmore, cookies", "cheese sandwich", "plain biscuits", "sugar crackers", "flavoured/cream/filled cookies-Oreo, creamO, lexus", "*kuih-muih-donut, karipap, pulut bakar, chakoi, bahulu, kuih keria, pau*", "cake"	7
Chocolate	"chocolate rice cereal-cococrunch, chocojar", "wafer bar-nabati, kitkat", "chocolate bar-cadbury, Toblerone", "chocolate nugget-milo"	4
Fast foods	"burger-Ramly, McD, KFC", "fried chicken-KFC, McD, Texas", "pizza-Pizzahut, Domino's", "French fries-KFC, McD", "nugget", "mashed potatoes", "coleslaw", "sausage/hotdog/frankfurter", "instant noodle maggi"	9
Confectionery	"sweet/lollipop", "jelly/custard", "ice-cream", "pastry-pai, croissant, tart", "street foods-takoyaki, keropok lekor, sweetened corn", "snacks/crackers-mister potato, twisties, salted nuts, corntoz, mamee, super rings, lays, *popia cheese*, shrimp cracker"	6

I-CVI Results (relevancy of individual food items)

I-CVI calculations for the food items' relevancy were presented in Table II. Item-Content Validity Items (I-CVI) from six expert panels determined that 55 items of the instruments had excellent content validity. There were only four items that needed to be revised due to the I-CVI levels of these food items being unacceptable. However, the overall content validity index of this FFQ was equal to 0.97 for Scale-Content Validity Item/Average (SCVI/Ave). It can be concluded that this FFQ's content validity is excellent.

Probability of chance agreement and Kappa Statistics

Table III shows the calculation of the probability of chance agreement (Pc) and Kappa statistics (K) for this newly developed FFQ. According to the results shown

Table II: Calculation of I-CVI for food items relevancy

Items/Domain	Result of content validity index		
	Number in Agreement	I-CVI	Interpretation
A. Fruit juice & drinks			
A1. Apple drink	6	1.00	Appropriate
A2. Orange drink	6	1.00	Appropriate
A3. Blackcurrant drink	6	1.00	Appropriate
A4. Soy drink	6	1.00	Appropriate
A5. Mango drink	6	1.00	Appropriate
A6. Lychee drink	6	1.00	Appropriate
A7. Iced lemon tea	6	1.00	Appropriate
A8. Chrysanthemum tea	6	1.00	Appropriate
A9. Various flavour cordial drink	6	1.00	Appropriate
B. Sweetened milk & cultured milk drinks			
B1. Strawberry flavoured	6	1.00	Appropriate
B2. Fresh milk	4	0.67	Need for revision
B3. Chocolate flavoured	6	1.00	Appropriate
B4. Full cream	5	0.83	Appropriate
B5. Yoghurt drink	6	1.00	Appropriate
B6. Yoghurt	6	1.00	Appropriate
C. Carbonated beverages			
C1. Cola	6	1.00	Appropriate
C2. Orange	5	0.83	Appropriate
C3. Isotonic drink	6	1.00	Appropriate
D. Sweetened chocolate malt, tea, & coffee			
D1. Malted drinks	6	1.00	Appropriate
D2. Ready-to-drink coffee	6	1.00	Appropriate
D3. Ready-to-drink tea	6	1.00	Appropriate
E. Vendor-made or home-prepared drinks			
E1. *Bandung*	6	1.00	Appropriate
E2. *Jagung*	6	1.00	Appropriate
E3. Iced chocolate	6	1.00	Appropriate
E4. Lychee in Syrup	6	1.00	Appropriate
E5. Iced tea	6	1.00	Appropriate
E6. Iced milk tea	6	1.00	Appropriate
E7. Pearl milk tea	6	1.00	Appropriate
E8. ABC	6	1.00	Appropriate
E. Vendor-made or home-prepared drinks			
E9. Hot tea	6	1.00	Appropriate
E10. Iced blend	6	1.00	Appropriate
E11. Pre-mixed drinks	6	1.00	Appropriate
E12. Coffee drinks	6	1.00	Appropriate
F. Biscuits, cake, & bread			
F1. Chocolate chips	6	1.00	Appropriate
F2. Cheese sandwich	6	1.00	Appropriate
F3. Plain biscuits	4	0.67	Need for revision
F4. Sugar Crackers	6	1.00	Appropriate
F5. Flavoured/cream/filled cookies	6	1.00	Appropriate
F6. *Kuih-muih*	6	1.00	Appropriate
F7. Cake	6	1.00	Appropriate
G. Chocolate			
G1. Chocolate rice cereal	6	1.00	Appropriate
G2. Wafer bar	6	1.00	Appropriate
G3. Chocolate bar	6	1.00	Appropriate

Table II: Calculation of I-CVI for food items relevancy (continued)

Items/Domain	Result of content validity index		
	Number in Agreement	I-CVI	Interpretation
G4. Chocolate nugget	6	1.00	Appropriate
H. Fast foods			
H1. Burger	6	1.00	Appropriate
H2. Fried chicken	6	1.00	Appropriate
H3. Pizza	6	1.00	Appropriate
H4. French fries	6	1.00	Appropriate
H5. Nugget	6	1.00	Appropriate
H6. Mashed potatoes	4	0.67	Need for revision
H7. Coleslaw	4	0.67	Need for revision
H8. Sausage/Hotdog/Frankfurter	6	1.00	Appropriate
H9. Instant Noodle Maggi	6	1.00	Appropriate
I. Confectionery			
I1. Sweets/Lollipop	6	1.00	Appropriate
I2. Jelly/Custard	6	1.00	Appropriate
I3. Ice-cream	6	1.00	Appropriate
I4. Pastry	6	1.00	Appropriate
I5. Street foods	6	1.00	Appropriate
I6. Snacks/Crackers	6	1.00	Appropriate
Proportion Relevance	S-CVI/Ave	0.97	Excellent

in the table, 55 items have excellent inter-rater reliability as their kappa values were above 0.74.

CVR Results (essentiality of each food item)
The result in Table IV shows the essentiality of each food item in this newly developed FFQ. Ten food items out of 59 were marked as not essential. The CVR for 49 items was 1.00, eight items scored 0.67, and two items scored 0.33.

Experts' comments on FFQ
Table V presents food items that needed for refinement or improvements. Expert 1 commented that plain and flavoured yoghurt in B (sweetened milk & cultured milk) section needs to be separated and proposed to add (Others:____) option for each section for the respondent to fill in the drinks that are not available in the FFQ. Next, Expert 2 stated that the B6 item needs to be changed to flavoured yoghurt. Meanwhile, Expert 3 suggested adding another flavour other than orange in section C (carbonated beverages). Expert 4 proposed adding other flavours for carbonated beverages which include grapes, strawberry, and apple. On the other hand, expert 5 recommended changing orange flavoured carbonated drinks to be more general on the flavours available in the market, removing the brand of products, and simplifying the items into an appropriate group. Last but not least, Expert 6 advised to change strawberry and chocolate flavoured milk to flavoured milk only and include another section for kuih-muih.

Food list refinement results
Based on the calculation of I-CVI, CVR, and experts'

Table III: Kappa Score for relevancy of each food item

Items/Domain	Result of kappa statistics		
	Pc	Kappa statistic	Interpretation
A. Fruit juice & drinks			
A1. Apple drink	0.016	1.00	Excellent
A2. Orange drink	0.016	1.00	Excellent
A3. Blackcurrant drink	0.016	1.00	Excellent
A4. Soy drink	0.016	1.00	Excellent
A5. Mango drink	0.016	1.00	Excellent
A6. Lychee drink	0.016	1.00	Excellent
A7. Iced lemon tea	0.016	1.00	Excellent
A8. Chrysanthemum	0.016	1.00	Excellent
A9. Various flavour cordial drink	0.016	1.00	Excellent
B. Sweetened milk & cultured milk drinks			
B1. Strawberry flavoured	0.016	1.00	Excellent
B2. Fresh milk	0.234	0.57	Fair
B3. Chocolate flavoured	0.016	1.00	Excellent
B4. Full cream	0.094	0.81	excellentt
B5. Yoghurt drink	0.016	1.00	Excellent
B6. Yoghurt	0.016	1.00	Excellent
C. Carbonated beverages			
C1. Cola	0.016	1.00	Excellent
C2. Orange	0.094	0.81	Excellent
C3. Isotonic drink	0.016	1.00	Excellent
D. Sweetened chocolate malt, tea, & coffee			
D1. Malted drinks	0.016	1.00	Excellent
D2. Ready-to-drink coffee	0.016	1.00	Excellent
D3. Ready-to-drink tea	0.016	1.00	Excellent
E. Vendor-made or home-prepared drinks			
E1. *Bandung*	0.016	1.00	Excellent
E2. *Jagung*	0.016	1.00	Excellent
E3. Iced chocolate	0.016	1.00	Excellent
E4. Lychee in Syrup	0.016	1.00	Excellent
E5. Iced tea	0.016	1.00	Excellent
E6. Iced milk tea	0.016	1.00	Excellent
E7. Pearl milk tea	0.016	1.00	Excellent
E8. ABC	0.016	1.00	Excellent
E9. Hot tea	0.016	1.00	Excellent
E10. Iced blend	0.016	1.00	Excellent
E11. Pre-mixed drinks	0.016	1.00	Excellent
E12. Coffee drinks	0.016	1.00	Excellent
F. Biscuits, cake, & bread			
F1. Chocolate chips	0.016	1.00	Excellent
F2. Cheese sandwich	0.016	1.00	Excellent
F3. Plain biscuits	0.234	0.57	Fair
F4. Sugar Crackers	0.016	1.00	Excellent
F5. Flavoured/cream/filled cookies	0.016	1.00	Excellent
F6. *Kuih-muih*	0.016	1.00	Excellent
F7. Cake	0.016	1.00	Excellent
G. Chocolate			
G1. Chocolate rice cereal	0.016	1.00	Excellent
G2. Wafer bar	0.016	1.00	Excellent
G3. Chocolate bar	0.016	1.00	Excellent
G4. Chocolate nugget	0.016	1.00	Excellent
H. Fast foods			
H1. Burger	0.016	1.00	Excellent
H2. Fried chicken	0.016	1.00	Excellent

Table III: Kappa Score for relevancy of each food item (continued)

Items/Domain	Result of kappa statistics		
	Pc	Kappa statistic	Interpretation
H3. Pizza	0.016	1.00	Excellent
H4. French fries	0.016	1.00	Excellent
H5. Nugget	0.016	1.00	Excellent
H6. Mashed potatoes	0.234	0.57	Fair
H7. Coleslaw	0.234	0.57	Fair
H8. Sausage/Hotdog/Frankfurter	0.016	1.00	Excellent
H9. Instant Noodle Maggi	0.016	1.00	Excellent
I. Confectionery			
I1. Sweets/Lollipop	0.016	1.00	Excellent
I2. Jelly/Custard	0.016	1.00	Excellent
I3. Ice-cream	0.016	1.00	Excellent
I4. Pastry	0.016	1.00	Excellent
I5. Street foods	0.016	1.00	Excellent
I6. Snacks/Crackers	0.016	1.00	Excellent

Table IV: Content Validity Ratio of Food Frequency Questionnaire

Items/Domain	Result of content validity ratio		
	N_e	CVR	Interpretation
A. Fruit juice & drinks			
A1. Apple drink	6	1.00	Remained
A2. Orange drink	6	1.00	Remained
A3. Blackcurrant drink	6	1.00	Remained
A4. Soy drink	6	1.00	Remained
A5. Mango drink	6	1.00	Remained
A6. Lychee drink	6	1.00	Remained
A7. Iced lemon tea	6	1.00	Remained
A8. Chrysanthemum	5	0.67	Eliminated/Refined
A9. Various flavour cordial drink	6	1.00	Remained
B. Sweetened milk & cultured milk drinks			
B1. Strawberry flavoured	6	1.00	Remained
B2. Fresh milk	5	0.67	Eliminated/Refined
B3. Chocolate flavoured	6	1.00	Remained
B. Sweetened milk & cultured milk drinks			
B4. Full cream	5	0.67	Eliminated/Refined
B5. Yoghurt drink	6	1.00	Remained
B6. Yoghurt	5	0.67	Eliminated/Refined
C. Carbonated beverages			
C1. Cola	6	1.00	Remained
C2. Orange	5	0.67	Eliminated/Refined
C3. Isotonic drink	6	1.00	Remained
D. Sweetened chocolate malt, tea, & coffee			
D1. Malted drinks	6	1.00	Remained
D2. Ready-to-drink coffee	6	1.00	Remained
D3. Ready-to-drink tea	6	1.00	Remained
E. Vendor-made or home-prepared drinks			
E1. *Bandung*	6	1.00	Remained
E2. *Jagung*	5	0.67	Eliminated/Refined
E3. Iced chocolate	6	1.00	Remained
E4. Lychee in Syrup	6	1.00	Remained
E5. Iced tea	6	1.00	Remained
E6. Iced milk tea	6	1.00	Remained
E7. Pearl milk tea	6	1.00	Remained
E8. ABC	6	1.00	Remained
E9. Hot tea	6	1.00	Remained

Table IV: Content Validity Ratio of Food Frequency Questionnaire (continued)

Items/Domain	Result of content validity ratio		
	N_e	CVR	Interpretation
E10. Iced blend	6	1.00	Remained
E11. Pre-mixed drinks	6	1.00	Remained
E12. Coffee drinks	6	1.00	Remained
F. Biscuits, cake, & bread			
F1. Chocolate chips	6	1.00	Remained
F2. Cheese sandwich	5	0.67	Eliminated/Refined
F3. Plain biscuits	5	0.67	Eliminated/Refined
F4. Sugar Crackers	6	1.00	Remained
F5. Flavoured/cream/filled cookies	6	1.00	Remained
F6. *Kuih-muih*	6	1.00	Remained
F7. Cake	6	1.00	Remained
G. Chocolate			
G1. Chocolate rice cereal	6	1.00	Remained
G. Chocolate			
G2. Wafer bar	6	1.00	Remained
G3. Chocolate bar	6	1.00	Remained
G4. Chocolate nugget	6	1.00	Remained
H. Fast foods			
H1. Burger	6	1.00	Remained
H2. Fried chicken	6	1.00	Remained
H3. Pizza	6	1.00	Remained
H4. French fries	6	1.00	Remained
H5. Nugget	6	1.00	Remained
H6. Mashed potatoes	4	0.33	Eliminated
H7. Coleslaw	4	0.33	Eliminated
H8. Sausage/Hotdog/Frankfurter	6	1.00	Remained
H9. Instant Noodle Maggi	6	1.00	Remained
I. Confectionery			
I1. Sweets/Lollipop	6	1.00	Remained
I2. Jelly/Custard	6	1.00	Remained
I3. Ice-cream	6	1.00	Remained
I4. Pastry	6	1.00	Remained
I5. Street foods	6	1.00	Remained
I6. Snacks/Crackers	6	1.00	Remained

Table V: Experts' comments

Experts	Comments
Expert 1	1. Separate plain and flavoured yoghurt in the Sweetened milk & cultured milk drinks section. 2. Add (Others: ____) option to each section for respondents to fill the drinks that are not available in FFQ
Expert 2	1. Suggest B6 item change to flavoured yoghurt
Expert 3	1. Add another flavour other than orange in the carbonated drinks section
Expert 4	1. Suggest additional flavour for carbonated drinks including grapes, strawberry, and apple
Expert 5	1. Change orange flavoured to flavoured carbonated drinks. 2. Suggest removing the brand of the products and simplifying them in an appropriate group
Expert 6	1. Change strawberry flavoured and chocolate flavoured milk to flavoured milk only 2. Add another section for *kuih-muih*

Table VI: Food list refinement

Item groups		Items	No. of items
Sugar-sweetened beverages	Fruit juice & drinks	"apple drink", "orange drink", "blackcurrant drink", "soy drink", "mango drink", "lychee drink", "iced lemon tea", "chrysanthemum", "various cordial drink"	9
	Sweetened milk & cultured milk drinks	"flavoured milk", "fresh milk", "full cream", "yogurt drink", "plain yogurt", "flavoured yogurt"	6
	Carbonated beverages	"cola", "flavoured carbonated beverages", "isotonic drink"	3
	Sweetened chocolate malt, tea, & coffee	"malted drink", "ready to drink coffee", "ready to drink tea"	3
	Vendor-made or home-prepared drinks	"*bandung*", "*jagung*", "iced chocolate", "lychee in syrup", "iced tea", "iced milk tea", "pearl milk tea", "ABC", "hot tea", "iced blend", "pre-mixed drinks", "coffee drinks-cappuccino, mocha, latte"	12
High-energy dense food	Biscuits, cake & bread	"chocolate chips", "cheese sandwich", "plain biscuits", "sugar crackers", "flavoured/cream/filled cookies", "cake"	6
	Kuih-muih	"*donut*", "*karipap*", "*pulut bakar*", "*chakoi*", "*bahulu*", "*kuih keria*", "*pau*"	7
	Chocolate	"chocolate rice cereal", "wafer bar", "chocolate bar", "chocolate nugget"	4
	Fast foods	"burger", "fried chicken", "pizza", "French fries", "nugget", "sausage/hotdog/frankfurter", "instant noodle"	7
	Confectionery	"sweet/lollipop", "jelly/custard", "ice-cream", "pastry-pai, croissant, tart", "street foods-takoyaki, *keropok lekor*, sweetened corn", "snacks/crackers"	6

comments, the final version of the food list of this newly developed FFQ had ten categories with 63 items. Table VI shows the finalized food items that were included in the FFQ.

Frequency response section and portion sizes for each food item

Frequency response choices for each food item in each food group were "never", "1 to 2 times per month", "once a week", "2 to 3 times per week", "4 to 6 times per week", "once a day", "2 to 3 times per day", "more than 4 times per day". Reference portion size for each food item was provided. In addition, a section of response choices for total serving size of every food item consumption was also included as "1", "2", "3", "4", and "> 5".

Face validity

The face validity of 10 adolescent responses was then evaluated. The questions and mentioned foods were understood by the participants. To help responders better comprehend the questions in the FFQ, minor changes were made to the content phrasing. They took not more than 20 minutes to complete the questionnaire.

DISCUSSION

Compared to other approaches, FFQs are a more cost-effective and feasible method for assessing dietary consumption in epidemiological studies (30). FFQs can also focus on specific nutrients (13). As the prevalence of overweight and obesity among Malaysian adolescents continues to rise, the use of FFQs in their research is gaining prominence, even though they are often originally designed for adults (23, 21). To address this, a data-based approach was used to develop an FFQ specifically for Malaysian adolescents, which is more likely to provide representative nutritional data (19).

However, cultural differences, food accessibility, and preferences may affect the applicability of adult-based FFQs to adolescents. Therefore, this study developed the first dietary assessment tool specifically for estimating the intake of SSBs and HED foods in Malaysian adolescents. The developed FFQ was carefully constructed to include food items that reflect the consumption of SSBs and HED foods among Malaysian adolescents, regardless of their sugar content.

The list of foods in this newly developed FFQ was based on foods that were commonly consumed by adolescents. Additionally, other food items that were considered to represent the population of interest were also included in the FFQ. The selection of 59 food items in the development phase was based on a previously tested approach (34), with an emphasis on SSBs and HED foods in the case of the 24-hour diet recalls. Adolescents aged 13 to 17 years old were involved in this FFQ development process to generate a list of the most relevant food items in Malaysian adolescents' diets. The FFQs are practical and appropriate instruments for estimating food intake in children over the age of eight years (7). It has been highlighted that adolescents aged 13 to 17 years old are capable of completing FFQs and providing credible information without parental assistance (16). Nevertheless, estimating an adolescent's nutritional intake is notoriously difficult due to the inability to accurately estimate the amount of food consumed (22).

Food photographs or food models were discovered to be an effective aid in estimating food portion-sized in adolescents (4). It is regarded as an effective and relevant instrument in studies with children aged 9 years old and above (20). Therefore, this study developed and validated the FFQ with guided food images to aid in estimating food portion sizes. One study examined

the distribution of several food items in 227 studies that used FFQs and found that the median number of food items was 79 with a range of 5 to 350 items (6). This newly developed FFQ contains 63 food items, which we believed is the optimal number of items for accurately assessing the intake of SSBs and HED foods without burdening the study participants.

The disclosure of procedures and findings for the content validity of beverages' FFQ is rarely reported in research. It is crucial to provide such information to aid in the interpretation of epidemiological data (47). According to Shrotryia & Dhanda (2019), content validity evidence can be presented by CVI. Although the most frequently used technique for determining content validity is to calculate the Item-level CVI (I-CVI), an alternative, unrecognised method for determining content validity is to compute the Scale-level CVI (S-CVI), which can be calculated using S-CVI/UA or S-CVI/Ave. The two approaches can produce inconsistent results, making it difficult to have an accurate conclusion about the content validity (28). The I-CVI assesses the content validity of individual items, whereas the S-CVI assesses the total scale's content validity. Since the majority of articles report the I-CVI and the S-CVI for their newly developed instruments, thus, this paper also included both of them (28).

The number of experts (n=6) was deemed sufficient for content validation, as the number of evaluators varied from three to ten (37). The invited experts were given seven days to respond to the invitation to participate in content validation steps, with several reminders sent out during the process. I-CVI value of 0.78 or above is considered excellent (38). All items in this newly developed FFQ had an I-CVI ranging from 0.67 to 1.00, with only four items having an I-CVI of less than 0.78. This appears to support the conclusion that individual items were significant and relevant for assessing the intake of SSBs and HED foods in adolescents. The S-CVI value between 0.80 and 0.90 is considered to be the minimum acceptable value (37). The calculated Average method suggested the overall content validity of this newly developed FFQ was high with S-CVI/Ave valued at 0.97.

Furthermore, the Kappa statistics, in particular, is an important complement to the content validity index, CVI, as it provides information about the degree of agreement that is not due to chance (11). It was suggested that a kappa value of 0.40 is the minimum for reasonable agreement (17), however, another study suggested that kappa values between 0.21 and 0.40 indicate reasonable agreement (47). In this present study, all items were under reasonable agreement with 55 items marked as excellent (k > 0.74) and 4 items marked as fair (k = 0.57), demonstrating that the agreement amongst experts was not coincidental.

Next, the CVR approach is a less commonly used method of determining content validity. This method determines the number of experts who consider an item to be essential. All the items had a positive CVR value indicating that at least half of the experts considered the items to be essential (31). According to Schipper's table, the critical CVR for items with a value of $\alpha = 0.05$ is 0.99 when six expert panels are involved (3). In this newly developed FFQ, ten items had a value less than 0.99, which is considered not essential to be included in the instrument. However, most of the items were marked as relevant indicating that they were closely related to the topic but due to inadequate clarity for items, it has resulted in a low CVR score (27). Therefore, nonessential items that were marked as relevant by the expert remained in the FFQ.

The face validity is a type of construct validity that is used to evaluate the theory or hypothesis measured, which frequently conducted for questionnaires validation (48). The results of this validity test were consistent with research validating the FFQ for Malaysian adolescents' habitual food consumption (49).

The major strength of this study is that it is the first study to develop an FFQ to assess the intake of SSBs and HED foods among adolescents. Besides, this FFQ was developed for adolescents using data that included food items typically consumed by them. Additionally, the portion size images included in the FFQ as a reference portion was meant to help the participant by allowing them to point a finger to a specific portion size when asked to estimate their food consumption. In addition, the extensive processes taken to assure the FFQ's validity are also one of the strengths worth noting.

CONCLUSION

In conclusion, this newly developed FFQ consisted of 63 food items which were classified into ten food groups. This FFQ is the first instrument to evaluate the consumption of SSB and HED foods among Malaysian adolescents. In addition, this FFQ showed high content validity for individual items and overall questionnaire. The food items that require amendment have been refined or modified following the expert panel's comments and feedback. Furthermore, the calculation of the Kappa statistic showed that this newly developed FFQ has excellent inter-rater reliability at the item level. Minor modifications also have been made to the FFQ according to the adolescents feedback.
Despite the positive outcomes, several limitations must be taken into consideration. Firstly, both food checklist and 24-hour diet recall have the same sources of inaccuracy such as relying on participants' memory and may be biased due to underestimation or overestimation. Secondly, this study used the 24-hour diet recall as a method for data collection. A single day of 24h diet recall is an inadequate way to figure out what an

individual usually eats because most people have a lot of variation in their food and nutrient intake from day to day. Therefore, this study established that the instrument possessed a sufficient level of content validity. The findings of this study imply that the newly developed FFQ could be utilised to estimate the intake of SSB and HED foods in Malaysian adolescents. Ultimately, this validated FFQ that was developed may appear to be a valuable tool for future studies to analyse the association between SSB and HED foods consumption and disease in this age group.

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REFERENCES

1. Abdullah N-F, Teo P, Foo L. Ethnic Differences in the Food Intake Patterns and Its Associated Factors of Adolescents in Kelantan, Malaysia. Nutrients. 2016 Sep 12;8(9):551. doi: 10.3390/nu8090551.

2. Alberga AS, Sigal RJ, Goldfield G, Prud' homme D, Kenny GP. Overweight and obese teenagers: why is adolescence a critical period? Pediatric Obesity. 2012 Mar 28;7(4):261–73. doi: 10.1111/j.2047-6310.2011.00046.x.

3. Ayre C, Scally AJ. Critical Values for Lawshe's Content Validity Ratio. Measurement and Evaluation in Counseling and Development. 2014 Jan;47(1):79–86. doi: 10.1177/0748175613513808

4. Brito AP, Guimarres CP, Pereira RA. Evaluation of photographs supporting an FFQ developed for adolescents. Public Health Nutrition. 2012 Nov 20;17(1):139–44. doi: 10.1017/S1368980012004867.

5. Burke BS. The dietary history as a tool in research. Journal of the American Dietetic Association 1947;23(12):1041-1046. doi: 10.1016/S0002-8223(21)43949-0

6. Cade J, Thompson R, Burley V, Warm D. Development, validation and utilisation of food-frequency questionnaires - a review. Public Health Nutrition. 2002 Aug;5(4):567-87. doi: 10.1079/PHN2001318.

7. Collins CE, Watson J, Burrows T. Measuring dietary intake in children and adolescents in the context of overweight and obesity. International Journal of Obesity. 2009 Nov 24;34(7):1103–15. doi: 10.1038/ijo.2009.241.

8. Crewson PE. Reader Agreement Studies. American Journal of Roentgenology. 2005 May;184(5):1391–7. doi: 10.2214/ajr.184.5.01841391

9. Garcia-Larsen V, Luczynska M, Kowalski ML, Voutilainen H, Ahlstrum M, Haahtela T, et al. Use of a common food frequency questionnaire (FFQ) to assess dietary patterns and their relation to allergy and asthma in Europe: pilot study of the GA 2 LEN FFQ. European Journal of Clinical Nutrition [Internet]. 2011 Jun 1 [cited 2021 Jul 20];65(6):750–6. doi: doi: 10.1038/ejcn.2011.15.

10. Gilbert GE, Prion S. Making Sense of Methods and Measurement: Lawshe's Content Validity Index. Clinical Simulation in Nursing. 2016 Dec;12(12):530–1. doi: 10.1016/j.ecns.2016.08.002

11. Handage S, Chander M. Development of An Instrument for Measuring the Student Learning Outcomes: A Content Validation Process. Indian Journal of Extension Education. 2021;57(03):01–7. doi: 10.48165/IJEE.2021.57302

12. Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia. (2018). National Health and Morbidity Survey (NHMS) 2017 (NMRR-16-698-30042): Adolescent Health and Nutrition Survey; Infographic Booklet : Produced and Distributed by National Health and Morbidity Survey 2017: Adolescent Health and Nutrition Survey. ISBN 978-983-2387-76-3.

13. Kyung Park M, Woo Kim D, Kim J, Park S, Joung H, Song WO, et al. Development of a dish-based, semi-quantitative FFQ for the Korean diet and cancer research using a database approach. British Journal of Nutrition. 2010 Nov 24;105(7):1065–72. doi: 10.1017/S0007114510004599

14. LAWSHE CH. A QUANTITATIVE APPROACH TO CONTENT VALIDITY. Personnel Psychology [Internet]. 1975 Dec;28(4):563–75. doi10.1111/j.1744-6570.1975.tb01393.x

15. Malik VS, Hu FB. Sugar-Sweetened Beverages and Cardiometabolic Health: An Update of the Evidence. Nutrients. 2019 Aug 8;11(8):1840. doi: 10.3390/nu11081840.

16. Martinez MF, Philippi ST, Estima C, Leal G. Validity and reproducibility of a food frequency questionnaire to assess food group intake in adolescents. Cadernos de Saúde Pública. 2013 Sep;29(9):1795–804. doi: 10.1590/0102-311x00055512.

17. Masson L, MCNeill G, Tomany J, Simpson J, Peace H, Wei L, et al. Statistical approaches for assessing the relative validity of a food-frequency questionnaire: use of correlation coefficients and the kappa statistic. Public Health Nutrition. 2003 Jun;6(3):313–21. doi: 10.1079/PHN2002429

18. Mohammadi S, Jalaludin M, Su T, Dahlui M, Azmi Mohamed M, Abdul Majid H. Determinants of Diet and Physical Activity in Malaysian Adolescents: A Systematic Review. International Journal of Environmental Research and Public Health. 2019 Feb 19;16(4):603. doi: 10.3390/ijerph16040603.

19. Shanita NS, Norimah AK, Abu Hanifah S.

Development and validation of a Food Frequency Questionnaire (FFQ) for assessing sugar consumption among adults in Klang Valley, Malaysia. Malaysian Journal of Nutrition [Internet]. 2012 Dec 1;18(3):283–93. Available from: https://pubmed.ncbi.nlm.nih.gov/24568069/

20. Nissinen K, Korkalo L, Vepsälᴀinen H, Mäkiranta P, Koivusilta L, Roos E, et al. Accuracy in the estimation of children's food portion sizes against a food picture book by parents and early educators. Journal of Nutritional Science. 2018;7:e35. doi: 10.1017/jns.2018.26.

21. Nurliyana AR, Mohd Nasir MT, Zalilah MS, Rohani A. Dietary patterns and cognitive ability among 12- to 13 year-old adolescents in Selangor, Malaysia. Public Health Nutrition. 2014 Feb 10;18(2):303–12. doi: 10.1017/S1368980014000068.

22. Nurul-Fadhilah A, Teo PS, Foo LH. Validity and reproducibility of a food frequency questionnaire (FFQ) for dietary assessment in Malay adolescents in Malaysia. Asia Pacific Journal of Clinical Nutrition. 2012;21(1):97-103.

23. Palaniveloo, L., Salleh, R., Baharudin, A., Siew, C., Ahmad, M., Shahida, N., & et al. (2021). Associations of Gender and BMI-for-age Status (BAZ) With Nutrient Intake Among Adolescents in Malaysia: Findings From Adolescent Nutrition Survey (ANS) 2017. Malaysian Journal of Medicine and Health Sciences, 17(1), 2636-9346. Available from: https://medic.upm.edu.my/upload/dokumen/2020123014343302_MJMHS_0501.pdf

24. Park Y, Dodd KW, Kipnis V, Thompson FE, Potischman N, Schoeller DA, et al. Comparison of self-reported dietary intakes from the Automated Self-Administered 24-h recall, 4-d food records, and food-frequency questionnaires against recovery biomarkers. The American Journal of Clinical Nutrition. 2018 Jan 1;107(1):80–93. doi: 10.1093/ajcn/nqx002.

25. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Research in Nursing & Health [Internet]. 2007;30(4):459–67. doi:10.1002/nur.20199

26. Rezali FW, Chin YS, Mohd Yusof BN. Obesity-related behaviors of Malaysian adolescents: a sample from Kajang district of Selangor state. Nutrition Research and Practice. 2012;6(5):458. doi: 10.4162/nrp.2012.6.5.458

27. Rodrigues IB, Adachi JD, Beattie KA, MacDermid JC. Development and validation of a new tool to measure the facilitators, barriers and preferences to exercise in people with osteoporosis. BMC Musculoskeletal Disorders. 2017 Dec;18(1). doi: 10.1186/s12891-017-1914-5.

28. Tepayakul R. Development of Indicators and Content Validity for School Administrators' Cultural Competency. Journal of Community Development Research (Humanities and Social Sciences) [Internet]. 2021 Oct 27 [cited 2022 Jan 24];14(4):46–58. doi: 10.14456/jcdr-hs.2021.35

29. Scaglioni S, De Cosmi V, Ciappolino V, Parazzini F, Brambilla P, Agostoni C. Factors Influencing Children's Eating Behaviours. Nutrients [Internet]. 2018 May 31;10(6):706. doi: 10.3390/nu10060706.

30. Sharma S. Development and use of FFQ among adults in diverse settings across the globe. Proceedings of the Nutrition Society. 2011 Feb 1;70(2):232–51. doi: 10.1017/S0029665110004775

31. Shrotryia VK, Dhanda U. Content Validity of Assessment Instrument for Employee Engagement. SAGE Open. 2019 Jan;9(1):215824401882175. doi: 10.1177/2158244018821751

32. Tavares LF, Fonseca SC, Garcia Rosa ML, Yokoo EM. Relationship between ultra-processed foods and metabolic syndrome in adolescents from a Brazilian Family Doctor Program. Public Health Nutrition [Internet]. 2012 Jan 1;15(1):82–7. doi: 10.1017/S1368980011001571

33. UNICEF. (2019). The State of the World's Children 2019. UNICEF. Retrieved from https://www.unicef.org/reports/state-of-worlds-children-2019

34. Willett, W. (2012). Nutritional Epidemiology. Third Edition. Oxford University Press. Oxford, New York: Oxford University Press. Retrieved from https://global.oup.com/academic/product/nutritional-epidemiology-9780199754038?cc=my&lang=en&

35. World Food Programme. (2009). Emergency Food Security Assessment Handbook (EFSA) - Second Edition, 2009. Retrieved from https://www.wfp.org/publications/emergency-food-security-assessment-handbook

36. Wynd CA, Schmidt B, Schaefer MA. Two Quantitative Approaches for Estimating Content Validity. Western Journal of Nursing Research. 2003 Aug;25(5):508–18. doi: 10.1177/0193945903252998

37. Yamada, J., Stevens, B., Sidani, S., Watt-Watson, J., & De Silva, N. (2010). Content Validity of a Process Evaluation Checklist to Measure Intervention Implementation Fidelity of the EPIC Intervention. Worldviews on Evidence-Based Nursing, 7(3), 158-164. doi:10.1111/j.1741-6787.2010.00182.x

38. Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majd H, Nikanfar A-R. Design and Implementation Content Validity Study: Development of an instrument for measuring Patient-Centered Communication. Journal of Caring Sciences [Internet]. 2015 Jun 1;4(2):165–78. doi: 10.15171/jcs.2015.017

39. Ochola S, Masibo PK. Dietary Intake of Schoolchildren and Adolescents in Developing Countries. Annals of Nutrition and Metabolism. 2014;64(s2):24–40. doi: 10.1159/000365125.

40. Bahadoran Z, Mirmiran P, Azizi F. Fast Food Pattern and Cardiometabolic Disorders: A Review of Current Studies. Health Promotion Perspectives

[Internet]. 2015 Oct 8;5(4):231–40. doi: 10.15171/hpp.2015.028.

41. Te Morenga L, Mallard S, Mann J. Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. BMJ. 2012;346:e7492. doi: 10.1136/bmj.e7492.

42. Hsieh S, Klassen AC, Curriero FC, Caulfield LE, Cheskin LJ, Davis JN, Goran MI, Weigensberg MJ, Spruijt-Metz D. Fast-food restaurants, park access, and insulin resistance among Hispanic youth. Am J Prev Med. 2014;46(4):378-87. doi: 10.1016/j.amepre.2013.12.007.

43. Fulkerson JA, Farbakhsh K, Lytle L, Hearst MO, Dengel DR, Pasch KE, Kubik MY. Away-from-home family dinner sources and associations with weight status, body composition, and related biomarkers of chronic disease among adolescents and their parents. J Am Diet Assoc. 2011;111(12):1892-7. doi: 10.1016/j.jada.2011.09.035. Erratum in: J Am Diet Assoc. 2012 May;112(5):762.

44. Kovalskys I, Fisberg M, Gymez G, Pareja RG, Yépez García MC, Cortés Sanabria LY, Herrera-Cuenca M, Rigotti A, Guajardo V, Zalcman Zimberg I, Nogueira Previdelli A, Moreno LA, Koletzko B; ELANS Study Group. Energy intake and food sources of eight Latin American countries: results from the Latin American Study of Nutrition and Health (ELANS). Public Health Nutr. 2018 Oct;21(14):2535-2547. doi: 10.1017/S1368980018001222

45. Lin WT, Huang HL, Huang MC, Chan TF, Ciou SY, Lee CY, Chiu YW, Duh TH, Lin PL, Wang TN, Liu TY, Lee CH. Effects on uric acid, body mass index and blood pressure in adolescents of consuming beverages sweetened with high-fructose corn syrup. Int J Obes (Lond). 2013 Apr;37(4):532-9. doi: 10.1038/ijo.2012.121

46. Hamd, N. F., Naing, N. N., Jalil, R. A., & Yamamoto, S. (2019). Development and Validation of the Beverages and Snacks Questionnaire for Malaysian Schoolchildren (BSQ-C). Environment-Behaviour Proceedings Journal, 4(12), 3-9. doi: 10.21834/e-bpj.v4i12.1909

47. Chiwaridzo M, Chikasha TN, Naidoo N, Dambi JM, Tadyanemhandu C, Munambah N, Chizanga PT. Content validity and test-retest reliability of a low back pain questionnaire in Zimbabwean adolescents. Arch Physiother. 2017;7:3. doi: 10.1186/s40945-017-0031-y.

48. Ginty AT Construct validity. Encyclopedia of behavioral medicine. 2013: 487-. doi: 10.1007/978-1-4419-1005-9_861

49. Mohamed K, Tin TS, Jalaludin MY, Al-Sadat N, Majid HA. Comparative validity of a Food Frequency Questionnaire (MyUM Adolescent FFQ) to estimate the habitual dietary intake of adolescents in Malaysia. Asia Pacific journal of clinical nutrition. 2018 Jul;27(4):898-907. doi: 10.6133/apjcn.022018.03