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Title: Exploration into School-Children's Food Preferences Aged between 7 and 12 Years in Malaysia: What Do We Know?

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Objective:

To explore parental feeding practices and to investigate the prediction domain of food preference from parent and child's perspectives.

Materials & Methods:

Two individual studies were conducted on Malay families with children aged 7 to 12 years. In a first study, mothers (n=17) participated in semi-structured focus group interviews answering specific questions on their knowledge of foods, drinks, and feeding practices. In a second study, Malay parent-child pairs (n=14) were recruited and both answered a newly developed 36-item Food Preference Questionnaire (FPQ) followed by virtual structured qualitative interviews. In both studies, interviews were audio and video-recorded, transcribed verbatim, back-translated, and analysed thematically according to the framework analysis technique. The FPQ was rated using a 5-point Likert scale.

Results:

In a first study, mothers perceived vegetables, chicken, fish, and plain water as healthy foods and drinks while unhealthy options were snacks, fast foods, and carbonated drinks. The mothers defined healthy foods as foods handled safely and can provide health benefits to the body. When mothers would like to ensure their children ate healthily, they used healthy cooking methods to prepare preferred foods and overtly controlled the child's access to unhealthy food. In a second study, the food groups reported by parent-child pair were consistent for the most preferred foods [snacks, median (IQR), parent: 4.5 (1.0) vs child: 4.5 (0.0), $p>0.05$] and least preferred food [legumes, parent: 2.0 (1.0) vs child: 2.0 (1.0), $p>0.05$]. When explored further, parents cited food sensory properties especially taste as the most significant determinant of food preference.

Conclusion:

These two studies were the first to explore qualitatively parents' perceptions of foods affecting their feeding practices among the Malaysian community to highlight the cultural contribution. They have provided key insights into children's food intake and factors influencing food preferences in Malaysia. These factors may inform targeted strategies in food preparation and feeding practices to encourage healthy eating for families.

Keywords: food preference, children, family, feeding practices, Malaysian

Introduction

The burden of malnutrition in children is one of the leading global health problems of the 21st century. High rates of childhood malnutrition are affecting both low- and middle-income nations in Asia [1], including Malaysia [2]. The significant rise in the national prevalence of stunting, overweight, and obesity amongst Malaysian children is of great concern [3]. Data from the National Health and Morbidity from 2011 to 2019 showed for children under 5 years of age, stunting has increased from 16.7% to 21.8%, and obesity amongst children aged between 5 and 17 years doubled (6.1% to 14.8%). Evidence posits that both undernutrition and overweight can propagate long-term effects, translating into huge economic implications [4]. In both contexts, there are greater risks of developing non-communicable diseases and infections leading to premature death, and morbidity in the young populations [5-6]. Recent estimates suggest that nearly half of all deaths in children under 5 years are attributable to undernutrition in developing countries [7].

Literature to date has identified parents to be one of the key predictors of children's dietary habits [8,9]. Predominantly in younger children, feeding practices exert definite influence over their environments and experiences in the early years of life [10], which consequently, impacts the children's attitude and behaviour towards their food intake. Feeding practices are proposed to be divided into two broad categories: directive and non-directive [11,12]. Directive control such as restriction and pressure-to-eat has been associated with unhealthy eating behaviours as they interfere with the child's innate ability to regulate eating [11,13,14]. In contrast, the non-directive control helps promote healthy behaviours and relationships with food [11,13,14] through positive role-modelling and a healthy food environment [15,16]. Taken together, the non-directive control in parental feeding practices could be considered as a more supportive approach to foster healthier eating habits in children [17].

While caregivers play a significant role in shaping dietary habits, food preference was found to equally impact the children's diet quality [18]. Food preference specifically on taste appears to be partially determined by genetics in children, which can contribute to pickiness in eating [19]. Pickiness is defined as a refusal to eat specific food groups or try new foods [20] and is more prevalent amongst young children [21]. Evidence posits there is an innate preference for sweet and salty tastes [22,23], and avoidance of bitter and sour flavours [24,25]. Amongst different age groups, the preference and intake of sweet foods were higher in children below 10 years, which declined upon adolescence and adulthood [26-28]. This suggests that such innate taste preferences are modifiable by dietary exposure and experience in later life [25], largely due to the impact of the environment including culture [29]. In Malaysia, among the ethnicities, the Malay adult population reported a greater preference for a Western-based food pattern that is high in salt, sugar, and fat [30,31]. Hence, there is a need to broaden the scope of studies to include children for a better comprehension of the relationship between their food preferences, dietary habits, and picky eating.

Previous studies examining feeding practices [32-34] have primarily used specific questionnaires [35,36] developed from the Western population [37-40]. However, as feeding practices are strongly influenced by environment and culture, children-focused studies remain relatively scarce in the Malaysian context [41]. It is widely accepted that the use of a qualitative approach allows for *in-depth* exploration to identify the gaps which essential when seeking to gain insights into picky eating. Therefore, two separate studies were carried out, where we investigated parents' knowledge about food, its effect on their feeding practices, and their children's food preferences. The studies were conducted in three waves: First, the parental level of knowledge of foods, drinks, and feeding practices was explored. Second, the child's food preferences and the prediction domain of food preference from

parent and child's perspectives were investigated. Third, the parents' food preference scores with the children's reporting were compared.

Methods

To answer the research questions, two individual studies were conducted. Study 1 is a qualitative study on parental knowledge of foods, drinks, and feeding practices. Study 2 utilised the mixed-method approach to assess additional variables on food preferences from perspectives of parents and their children using a questionnaire and followed by structured interviews.

Study 1

Participants were recruited using the purposive sampling method from primary schools and local communities in Kuala Lumpur, Malaysia. Ethical approval was obtained from the International Medical University Joint Committee [BDN 1-2019(20)]. Permission to recruit from local educational institutes and residential communities were obtained respectively where invitation pamphlets were sent to all parents. Eligible participants must be the main caregivers of a child aged between 7 and 12 years of Malay ethnicity. The specific age was selected because of the lack of validated questionnaires investigating child-reported food preferences in an age-appropriate manner and that literature has suggested that children aged six years and above could accurately report their food preferences [42]. The main caregiver was defined as adults staying together with the child most days of the week and primary decision-maker for foods practices (purchasing of groceries, food preparation, and/or serving) [43]. Consenting caregivers were invited to attend face-to-face semi-structured focus group discussions, conducted between February and March 2020.

Instrument And Procedures: The interview guide (Table 1) was developed based on the restriction domain of the Child Feeding Questionnaire [36] and an in-depth literature review on feeding practices. The face validity of the interview guide was tested with three participants, conducted by one moderator (YDL) and an observer (WYY). Minor amendments were made to the interview guide based on feedback on the clarity of questions in the interview guide. Subsequent interview sessions were run by a moderator (YDL). The focus group consisted of two to five participants each time. All focus groups were conducted in a private discussion room in the school or community hall. At the start of each focus group, participants were briefed on the study objectives, data privacy, and confidentiality. Participants were also asked to complete a brief demographic questionnaire and household income based on the national classifications [44]. Participants were encouraged to express their thoughts freely based on open-ended questions, guided by an interview guide. Each group lasted 60 minutes on average and was audio and video recorded. Sampling, recruitment, and focus group interviews continued until data saturation is reached. When there was a voice recording of the conversation in the Malay language, the recording was translated from Malay to English followed by transcription of verbatim by YDL and checked by WYY who are proficient in both languages.

Data Analysis: The transcribed data was coded into the frequency of responses and organized into several themes and sub-themes. The sub-themes were grouped through the recurring explanations by the parents which represented the thematic units [45]. This thematic analysis process was done manually using the Microsoft Excel spreadsheet by the research team (YDL, WYY, and SHO). Final thematic analysis, categorisation, and conclusions were reached by consensus of all members. Exemplar key quotations were identified within each theme to illustrate the views of the participants.

Table 1: Discussion Questions Asked during Focus Group Discussion (Study 1)

Interview Guide

-
1. How do you define healthy and unhealthy foods?
 2. What are the foods you think are healthy and unhealthy?
 3. When you think the food is healthy, do you allow your child to have it?
 - a. If the answer is no:
 - i. Why do you disallow?
 - ii. How do you disallow?
 - b. If the answer is sometimes:
 - i. What makes you decide to give at times?
 - ii. How do you decide to give?
 - iii. How often do you allow?
 - c. If the answer is yes:
 - i. What makes you decide to allow the children to have it?
 - ii. How do you decide to give?
 - iii. How often do you allow it?
 4. When you think the food is unhealthy, do you allow your child to still have it?
 - a. If the answer is no:
 - i. How did you disallow it?
 - b. If the answer is sometimes:
 - i. How did you disallow it?
 - ii. How often do you still allow?
 - iii. What makes you decide to still allow it at times?
 - c. If the answer is yes:
 - i. How often do you allow your child to have it?
 - ii. What are the reasons you allow your child to have unhealthy foods?
-

Study 2

In the second study which took place during the Covid-19 pandemic, a semi-qualitative study was conducted virtually for parent-child pairs between February 2021 and June 2021. Ethical approval was obtained [BDN 1-2020 (12)] and digital recruitment messages were randomly disseminated to recruit free-living, Malay children aged 7 to 12 years old and their parents from Klang Valley, Malaysia. The inclusion criteria were determined as (i) children aged 7 to 12 years old, (ii) in good health condition, (iii) having their parents as their main caregiver (defined as staying together most days of the week and the main decision-maker for food practices). Eligible participants were contacted to provide the child's assent and parental consent before completing an online questionnaire and the structured interviews.

Instrument And Procedures: In contrast to Study 1, a questionnaire on food preference was used for more accurate reporting by children and parents to determine children's food preferences. The list of food and drinks in Food Preference Questionnaire (FPQ) was retrieved from a local dietary study on pre-adolescent Malay children. The 36-item FPQ of 5-point Likert scale questionnaire ("dislike a lot", "dislike", "neutral", "like", and "like a lot" was modified from Jani et al [46] to meet the requirements of the Malaysian population. During the online interviews, children and their parents were asked individually in detail on the factors affecting the children's preferences. The questions used were adapted from the Food Choice Questionnaire [47], which was validated amongst Malaysian adolescents [48]. Each interview session was recorded using Microsoft Teams Version 4 (Microsoft Corporation, Kuala Lumpur, Malaysia), consisting of one facilitator and one recorder (KYL and PLY).

Data Analysis: Statistical analyses were performed using the SPSS software (v26.0, Armonk, NY: IBM Corp) on the quantitative data (sociodemographic and food preference). For each item in the FPQ, median and interquartile range (IQR) values, and number and percentages were calculated. The food preference scores based on the 5-point Likert scale of the parent-child pairs were compared using the

Mann-Whitney U test (significance level of $P < 0.05$). The recorded interviews were transcribed and back-translated (KYL and PLY). Themes and coding were generated via thematic analysis using Microsoft Excel Version 26 (Microsoft Corporation, Kuala Lumpur, Malaysia) until data saturation was reached [49,50].

Results

Characteristics of participants: Table 2 summarises the participant's sociodemographic background. In Study 1, seventeen participants completed their focus groups in seven interview sessions. All participants were mothers with half of them being housewives and the remaining working (47.1%). Eleven participants attained a secondary level of education and thirteen of them reported monthly household income less than RM4500 (approximate USD 1125). About 82.4% of the participants were the main person deciding on the household food practices while others shared the responsibility with their spouses. In Study 2, 14 parent-child pairs participated with more girls (71.4%) than boys (28.6%), and more mothers (85.7%) than fathers (14.3%). Contrary to Study 1, most parents were working full time (57.1%) with a college or university education level (85.7%) with higher total family monthly income between RM 4500 to RM 10000 (42.9%).

Table 2. Characteristics of Participants in Study 1 and Study 2

	Study 1 (N=17)	Study 2 (N=14)	
	Parents, n (%)	Parents, n (%)	Children, n (%)
Gender			
Male	NA	2 (14.3)	4 (28.6)
Female	17 (100)	12 (85.7)	10 (71.4)
Age (years) ^a	40.1 (5.0)	42.9 (6.0)	10.0 (4.0)
Employment status			
Full time	6 (35.3)	8 (57.1)	NA
Part-time	NA	1 (7.1)	
Self-employed	2 (11.8)	4 (28.6)	
Others (Housewife)	9 (52.9)	1 (7.1)	
Highest level of education			NA
Primary	2 (11.8)	NA	
Secondary	11 (64.7)	2 (14.3)	
College/ University	4 (23.5)	12 (85.7)	
Family size (members)			NA
3 to 4	3 (17.6)	6 (42.8)	
5 to 6	10 (58.8)	5 (35.7)	
7 and above	4 (23.5)	3 (21.4)	
Total family monthly income ^b			NA
< RM4500 (B40)	13 (76.5)	4 (28.6)	
RM 4500- RM 10000 (M40)	2 (11.8)	6 (42.9)	
>RM 10000 (T20)	2 (11.8)	4 (28.6)	
Household Main Food Decision-Making			NA
Yes	14 (82.4)		
Share with spouse	3 (17.6)		

NA: Not Applicable; ^aIQR= Interquartile range; ^b Based on the household income group categorisation by the Department of Statistics, Malaysia (DOSM) [44]

Knowledge and attitude on healthy and unhealthy foods: In Study 1, while all participants reported vegetables were healthy, most participants stated fish as a healthier option as compared to prawns and squid. For the definition of healthy foods, most participants identified them as foods with beneficial effects and unhealthy foods being harmful to the body. The other elements of healthy foods include being rich in vitamins, protein, and fiber, less oily, and handled safely. Plain water was mostly reported as a healthy beverage because it is safe for consumption and did not contain any additives in contrast to carbonated drinks and sweetened beverages named as unhealthy beverages. Common local snacks such as banana fritters, potato chips, or fish chips “*keropok lekor*” were most frequently reported as

unhealthy food. Eight participants classified fast food as unhealthy mainly attributed to its characteristics of high salt, high fat, and high sugar. Food stalls along the roadside and poor food handling were cited as the source of unhealthy food. Nearly all participants reported they provided healthy food to their children daily. When it comes to unhealthy food, most parents did not restrict their child's intake and allow it occasionally, only two participants completely restricted their child from consuming unhealthy food.

"I feel that the foods are healthy as long as the foods are prepared by myself or at home. This is because I can control the content, amount of oil and other additives, moreover I can control the cooking method"(SKB2-009)

"I feel that water is a good drink as our body needs water." (SKB2-014)

"Eating oily foods and fast foods will make our body fat or become sick and increase our cholesterol level." (PPRK-003)

"Those snacks that are sold in food stalls along the roadside, I feel that they are unhealthy as I don't know what kind of food source they use. I am not sure about the quality of oil they used too. Besides that, hygiene is also an issue." (SKB2-007)

"Yes, I will give my child those foods. But I will only give those foods sometimes. I usually cook according to my child's preference which is my priority." (SKB2-008)

"I will not give that unhealthy food at all. If the children crave for that food, I will try to prepare those foods myself so that it is healthier." (SKB2-002)

Perception and feeding practices on healthy and unhealthy foods: Three key themes (Table 3) were identified from Study 1 on participants' attitudes towards unhealthy foods; factors affecting child's food preference, reasons of providing unhealthy foods, and avoidance of unhealthy foods. Data saturation was observed when reached the seventh group, indicating that a comprehensive of the topic was achieved.

Table 3. Themes on Parental Perception and Feeding Practices on Healthy and Unhealthy Foods (Study 1)

Key Theme	Sub-themes
1. Factors affecting child's food preference	Age when exposed to new foods Child own likings Cooking methods of the foods The knowledge provided to the children Eating practices of peers Serving methods of the foods Behaviors of different role models Convince the child to try new foods choices introduced Choose foods with a longer shelf life to make sure the children always get to have those healthy foods
2. Reasons for providing unhealthy foods	Feel sorry for the children, wanted to make the child happy To let the child have a taste of those foods To satisfy the child's craving and preference Unable to control the child when not under the direct supervision
3. Avoidance of unhealthy foods	Try to prolong the interval of giving to decrease the frequency of providing the foods Cook the foods craved by the child herself Decrease the amount of the foods bought and stored Educate the child about the side effects of taking those foods Cook/buy healthier choices of similar foods Distract the child's attention while in conflict Check on pocket money and limit the pocket money of the children when not under the supervision Not giving those foods when under supervision Provide other foods as an alternative Ask the siblings to supervise each other while in school Punish the child when the child buys those foods themselves

Key theme 1 (Factors affecting child's food preference): The participants identified various factors affecting the child's food preference including the child's liking, cooking methods of the foods, and how foods are served. Most participants stated that their children accepted most, or all foods provided to them. This allowed them to ensure a balanced food intake by providing different types of foods. The participants reported that their children would eat those foods that were prepared to meet the child's acceptance or preference. Therefore, they would mix perceived healthy foods together with the child's preferred foods into a single dish to encourage their child to eat healthily.

"I will ask my children what kind of foods they want to eat and how frequently they want to eat because my children eat almost everything. I won't force them to eat foods they don't like, but I will make sure they have a balanced nutrient intake while preparing their foods." (SKB2-011)

"Cooking methods of the meal affects the intake of my child's meal. He eats more fruits than vegetables, therefore I will prepare the foods with the cooking method acceptable to him to make him eat more vegetables. For example, I will cut the vegetables to smaller pieces so that he will eat those vegetables." (SKB2-003)

"If I don't have time to make various dishes, I will try to incorporate all the food in one dish." (SKB2-009)

"Currently my child likes the foods to be cooked in "paprika" (stir-fried with chili paste), so I will mix vegetables into the dish so that he will eat more. He likes to eat chicken only but if ~~the foods~~ other foods such as vegetables and fish are cooked in "paprika", he will eat all those foods." (SKB2-001)

"I will persuade my children to try new foods or let them follow the behaviours of cartoon characters' having the healthy food in the show." (PPRK-003)

Key theme 2 (Reasons for providing unhealthy foods): Various reasons were reported by the participants when being asked why unhealthy foods were provided to their children. They were more likely to compensate or treat the child's preferred food, i.e. "snack" food as a reward. Besides that, some participants could not completely control their children's diet. Their children would either buy or prepare unhealthy foods themselves when they were unsupervised by their parents. A few stated that other adults in the family could be barriers to controlling children's food intake because they were the ones who provided unhealthy foods to the children. The participants mainly avoided confronting those adults.

"I will still give those foods to my children once a week during the weekends, as the children have been eating all those healthy foods during the weekdays, I feel sorry for them if I don't reward them with some foods they like. Besides that, I don't want them to experience peer pressure from their friends when comparing with each other." (SKB2-015)

"It is hard for me to have control totally as the children will cook for themselves too. If they cook for themselves, I will reduce the times I cook that unhealthy food for them." (PPRK-005)

"Sometimes my husband will cook instant noodles, therefore they will share, maybe twice times a week." (SKB2-014)

Key theme 3 (Avoidance of unhealthy foods): Some participants reported that they would control the number of unhealthy foods purchased to reduce the frequency of providing such foods to the children. Some provided other foods as alternatives or cooked the foods in healthier methods. Other methods used by the participants such as educating the child about the side effects of excessive intake of those unhealthy foods, prolonging the interval of giving the foods to decrease the frequency of providing or distracting the child's attention when they are conflicted about food choices. One participant reported that she had a family history of diabetes, so she avoided unhealthy foods exposure to her child completely to prevent them from getting diabetes. Through observation, her child was obese, which is

a risk factor for diabetes. The awareness has created a restrictive feeding practice on the foods imposed onto her children.

“I will still provide that food to my children but under control. Usually, I won’t buy too much of that food and not too frequent too.” (SKB2-004)

“Once in a month, when they request for that food, I will buy them similar food which is healthier. At times when they insist to buy the food, I will still control the amount they buy.” (SKB2-007)

“I will not give those unhealthy foods at all. I have diabetes and I am afraid that my children have the chance of getting diabetes too. So, to reduce their chances of getting diabetes, I restrict them from getting those foods completely. If the children crave those foods, I will try to prepare those foods myself so that it is healthier.” (SKB2-002)

Children’s Food Preference and Their Parental Perception: The FPQ used in Study 2 found across the 13 food groups, snacks were the most preferred food by the children [4.5 (0.0)] while legumes were the least preferred [2.0 (1.0)] as shown in Table 4. Within the snacks group, they preferred crispy snacks over the filled or flavoured biscuits with a slightly higher median preference score of 5.0 (1.0). Similarly, the parents scored the highest preference for the snacks group [4.5 (1.0)] and lowest for legumes [2.0 (1.0)], hence no statistical difference was observed. Of the 36 individual food items listed, rice-based dishes, cultured and flavoured milk, and crispy snacks were the most preferred foods [5.0 (1.0)].

Table 4: Number of Children who tried each food and Food Preference Score (Study 2)

Food item	Children			Parents		
	Children who have tried the food	Food preference score		Children who have tried the food	Food preference score	
	N (%)	Median	IQR	N (%)	Median	IQR
Rice, Noodle, Bread, Cereals, Cereal Products and Tubers						
Bread/ pau/ bun	14 (100)	4.0	1.0	14 (100)	4.0	1.0
Rice	14 (100)	4.0	1.0	14 (100)	4.0	2.0
Flour-based bread	14 (100)	4.0	2.0	14 (100)	4.0	1.0
Rice-based	14 (100)	5.0	1.0	14 (100)	5.0	1.0
Noodles-based	14 (100)	4.0	1.0	14 (100)	4.0	1.0
Fruits						
Apple	14 (100)	4.0	1.0	14 (100)	4.0	2.0
Banana	14 (100)	4.0	1.0	14 (100)	4.0	1.0
Guava	13 (92.9)	4.0	3.0	14 (100)	3.0	2.0
Mango	14 (100)	5.0	1.0	14 (100)	4.0	2.0
Orange	14 (100)	4.0	1.0	14 (100)	4.0	0.0
Watermelon	14 (100)	4.0	3.0	14 (100)	4.0	2.0
Vegetables						
Cabbage	13 (92.9)	3.0	1.0	14 (100)	2.0	1.0
Carrot	14 (100)	4.0	2.0	14 (100)	4.0	2.0
Cauliflower	13 (92.9)	2.0	3.0	14 (100)	3.0	2.0
Cucumber	13 (92.9)	4.0	2.0	14 (100)	3.0	3.0
Water spinach	12 (85.7)	3.0	2.0	14 (100)	3.0	2.0
Meat/ Poultry						
Chicken	14 (100)	4.0	1.0	14 (100)	4.0	1.0
Hen egg	14 (100)	4.0	1.0	14 (100)	4.0	1.0
Processed meat/ poultry	13 (92.9)	4.0	1.0	14 (100)	4.0	2.0
Fish and Shellfish						
Fish	14 (100)	4.0	2.0	14 (100)	4.0	2.0
Squid	13 (92.9)	4.0	2.0	14 (100)	4.0	3.0

Legumes						
Chickpea/dhal/baked beans/green bean	12 (85.7)	2.0	2.0	14 (100)	2.0	1.0
Milk and Milk Products						
Plain milk	14 (100)	5.0	1.0	14 (100)	4.0	2.0
Cultured milk	14 (100)	4.0	2.0	14 (100)	5.0	1.0
Flavored milk	14 (100)	3.0	1.0	14 (100)	5.0	1.0
Sugar-Sweetened Beverages						
Carbonated drinks	12 (85.7)	4.0	1.0	14 (100)	4.0	1.0
Sweetened beverages	13 (92.9)	5.0	1.0	14 (100)	4.0	2.0
Cocoa-based drink	14 (100)	4.0	1.0	14 (100)	4.0	2.0
Kuih, Pastries, Cakes						
Steamed local <i>kuih</i>	12 (85.7)	4.0	2.0	14 (100)	3.0	2.0
Fried local <i>kuih</i>	14 (100)	4.0	2.0	14 (100)	3.0	1.0
Dessert	14 (100)	4.0	1.0	14 (100)	4.0	2.0
Snacks						
Crispy snacks	14 (100)	5.0	1.0	14 (100)	5.0	1.0
Filled/ flavoured biscuits	14 (100)	4.0	0.0	14 (100)	4.0	1.0
Sugars						
Condensed milk	11 (78.6)	3.0	2.0	13 (92.9)	3.0	0.0
Oils						
Cooking oil/ mayonnaise/ margarine/ butter/ salad dressing/ gravy	13 (92.9)	3.0	2.0	14 (100)	3.0	1.0
Condiments						
Sauces, vegemite	14 (100)	3.0	2.0	14 (100)	3.0	1.0

IQR= Interquartile range

Factors Influencing the Children's Food Preference: Table 5 outlines the factors affecting the food preferences as reported by the parent-child pairs. Based on the children's responses, there were a total of nine key themes identified.

Table 5: Factors influencing Children's Food Preferences (Self-reported and Parental report)

Children self-report		Parental report	
Key themes	Sub-themes	Key themes	Sub-themes
Food sensory properties	Taste (n = 14) Cooking method (n = 13) Texture (n = 13) Appearance (n = 3) Smell (n = 2)	Food sensory properties	Taste (n = 13) Cooking method (n = 6) Texture (n = 5) Appearance (n = 4)
Food association	Food components/ ingredients (n = 12) Food pairing (n = 9) Food experiences (n = 2)	Familial influence	Family exposure (n = 4) Family practice (n = 2) Family role modelling (n = 1)
Food availability and accessibility	Convenience (n = 6) Store food availability (n = 6) School food availability (n = 5)	Food availability and accessibility	Convenience (n = 3) Food price (n = 2) Cultural preference (n = 2)
Familial influence	Parental exposure (n = 7) Siblings' exposure (n = 4) Relatives' exposure (n = 3)	Internal cues	Craving (n = 6) Hunger (n = 3)
Internal cues	Satiety (n = 8) Appetite (n = 1)	Media influence	Advertisements (n = 3) Social media (n = 1)
Nutrition	Nutrition value (n = 5) Energy supply (n = 4)	Meal pattern (n = 2)	

Health and Wellbeing (n = 7)	Food acceptance (n = 1)
Media influence	TV advertisements (n = 4) Social media (n = 1)
Peer influence (n = 3)	

Among all these factors, food sensory properties such as taste, texture, appearance, and smell of the food appeared to be the most significant determinant of the children's food preference. Moreover, some children also attributed their preference for certain foods to food association, food availability, and accessibility, familial influence, internal cues, nutrition, health and wellbeing, media influence, as well as peer influence.

"I dislike cabbage and cauliflower because they taste bitter." (C3-ADBAI)

"I like steamed local kuih because it tastes sweet. And the shapes are beautiful." (C10-ABBMA)

"I like nasi lemak because of its fragrant smell." (C8-NISBH)

"I like plain milk because it can be eaten with breakfast cereal." (C3-ADBAI)

"I like crispy snacks because they are easy to eat." (C3-ADBAI)

"I like water spinach because mummy always cooks it." (C10-ABBMA)

"I prefer noodles compared to rice because rice is too full for me." (C1-RRR)

"I like orange because it has vitamin C." (C9-TNE)

"I like snacks and carbonated drinks because I saw them from advertisements." (C4-ASH)

"I dislike watermelon because my friend thinks it tastes juicy. I dislike the juiciness." (C14-ZZBAH)

Likewise, the parents also perceived the main contributor to their children's food preference to be the sensory properties. Furthermore, some parents also attributed their children's preference for certain foods to early introduction during infancy, family dietary practices, food culture, and social media exposures.

"For my child, I think it is because of the taste of the food. The sweet taste will indeed cause her to like the food more." (P10-SBMS)

"She likes the way I prepare it. If it is the Enoki mushroom, she will only take it in Tom Yam soup but not other cooking methods." (P07-NBAS)

"To be honest, I think for the vegetables, it is because I introduced it very early when she was still young. You know, during the weaning stage?" (P04-AAG)

"I think one is because those foods are a part of our diet menu that we have provided to him since he was young." (P06-MNKEBH)

"I mean like bread or rice, all of it is because it is normally eaten by the Malays. So, it is like our staple food." (P02-RBI)

"Nowadays, on Instagram, TikTok or Facebook, she sees the programs where people like to show themselves eating. So, this makes the food look appetizing and she will persuade me to buy it." (P10-SBMS)

Discussion

Results from both studies extend previous literature examining parental feeding practices and dietary intake amongst Malaysian children [37-40]. To our best knowledge, these two studies were the first to explore parents' perceptions of foods and practices affecting their feeding practices and children's food preferences. In Study 1, the child's food choices include both healthy and unhealthy food which strongly influenced their parental feeding practices. The bi-directional relationship between food preference and feeding practices affected how the mothers prepared the food for the child and their families. In Study 2, the food preference scores by parent-child pair were consistent but insignificant for the most (snacks) and least (legumes) preferred foods. Both child and parent's reporting seemed to

arise from the same factor of taste being the most significant determinant of food preference aside from other factors.

The parental knowledge about healthy foods reported in Study 1 was consistent with other studies [51-52]. Similarly, the benefit of consuming plain water cited by the participants was an encouraging finding. This observation can be partly explained by the health-promoting effects linked to these foods such as vegetables being well-known as rich sources of phytochemicals [51], high intake of poultry and fish clusters had healthier overall eating patterns and lifestyles [52], and plain water was found to decrease the intake of other caloric beverages [51] and improve the adequacy of micronutrients intake [53]. Since 2003, the Malaysian government has introduced various health initiatives to create public awareness of health and wellness. A 'Healthy Lifestyle Campaign' focusing on four basic elements including healthy eating was the first to be launched to promote more fruits and vegetables and choose food low in sugar, salt, and fat [54]. Recently in 2019, the sugar-sweetened beverages tax was enforced as a preventive measure to curb obesity and associated non-communicable diseases [55]. Aside from familial factors, governmental efforts are essential at the public health level to respond to the nutrition transition in developing Asian countries such as Malaysia.

In Study 1, the child's food preference was a major factor affecting their parent's feeding practices. Most parents did seek to find a balance between healthy food and beverages, and the child's preference. Other parents masked nutritious foods using cooking methods that were acceptable to the children. Such practices are usually adopted by parents of older children to ensure that their children have an adequate intake of healthy foods [56]. While this could be temporary, it provides an opportunity for parents to introduce healthy food since most of them were the main decision-maker on groceries in their families, in an attempt to let their children, learn to eat nutritiously. Some strategies used by mothers such as prolonging the interval of providing unhealthy foods and educating about the side effects of excessive food intake could be counterproductive [57-58]. Commonly used in the traditional Asian culture [59], by prolonging the interval, children may be diverted away from their cravings which resulted either in delaying the request for unhealthy foods or ultimately lessening the frequency of children's intake. Studies have shown that restrictive practices demonstrated by parents had significantly reduced children's consumption of unhealthy foods [57,60], however, its long-term effect should be examined closely to ascertain its effectiveness.

In Study 2, snacks were identified by the Malay parent-child pairs to be the most preferred food group by the children. From the parental perspective, food groups that were occasionally provided, such as snacks and sugar-sweetened beverages, were perceived as more preferred than core food groups. In contrast, previous research showed that children preferred foods or drinks that are easily obtained or consumed which closely relates to the availability and accessibility of such foods at home [61,62]. Food accessibility and availability for the families were not explored explicitly in this study, mothers did share about regulating the types of foods and drinks made available at home. One possible explanation for the least preferred food is the children's unfamiliarity and lack of exposure to legumes. This was consistent with findings from a local study reporting Malay primary school children exhibited a low preference for beans because legumes were less recognized by them [41]. Since repeated exposure is necessary to promote children's familiarity and acceptability of food [63], leguminous vegetables would be less preferred as compared to the traditional vegetables such as '*ulam*' in the Malay ethnicity [64].

Literature demonstrated that parental healthy food knowledge indirectly impacts their children's intake and behaviour [8,9], the same was observed in Study 2, where fruits and vegetables, and protein-rich foods, are the most recognised nutritious foods by children. Positive parental role modelling helps promote healthy behaviours and relationships with food in the children [11,13-16]. With better

nutrition knowledge, parents were able to prepare healthier foods or to deal with unhealthy food choices in their families [65] and will reduce the possibility of unhealthy beverages available at home. However, knowing the health benefits of the foods may not guarantee a preference for healthier foods and rejection of unhealthy foods, because of other significant factors like taste appeals. Thus, it is important to integrate taste as determinants of food intake in the young population.

The overall results in both studies showed that taste took precedence in children's food preferences similar to previous research on key determinants of children's food preferences [24,25,66-69]. Of all the tastes, children generally showed a preference for sweet food, while expressing dislike for bitter food, which is by the theory of biological influences on food preferences [25,70]. For instance, sweetness may indicate a source of energy and calories that are essential for survival, while bitterness or sourness may signal the presence of toxins or bacteria that endanger health [70]. This explained why most of the children prefer fruits over vegetables and disliked beans the most. Other aspects such as food texture and appearance should be considered. While several studies found strong associations between preference for certain foods with their textures [41,71], results were inconsistent for appearance which may be attributed to the use of plate colours, as opposed to food or packaging visuals [72].

Media was found to play a key role in exposing the children in this study to the foods they liked, particularly unhealthy foods. The impact of media on a child's dietary intake has been widely established [72,73]. This could probably owe to screen-time, whereby children nowadays are exposed to an increasing and unprecedented amount of advertisement, publicity, and commercialism across various online platforms. Based on a parent's response, the appetizing images of foods shown in television advertisements often caused her child to crave and request the food. Her perception may be justified by Seth and Sharma (2013) who found an association between longer television screen-time and increased junk food cravings [74]. Children, especially those under the age of 12, are a vulnerable group that needs to be protected from commercial influences that promote unhealthy foods and drinks which could negatively impact their health, as some of them are still unable to distinguish between facts and advertisements. This argument can be supported by Kraak *et al.* who found the television advertisements can affect food preferences, purchase requests and dietary intake amongst children aged 2 to 11-year-old and was linked to an uptick in childhood obesity rates [75].

Limitation of study

The main limitation of both studies is the relatively small sample size, which cannot fully represent the feeding practices and food preferences among Malay children in Malaysia. Nevertheless, thematic data saturation was still achieved as further coding could not be conducted [49]. The homogenous sample of Malay participants residing in Klang Valley also restricts the generalisability of the research findings to other ethnic groups and geographical regions in Malaysia. Moreover, potential recall bias may arise throughout the data collection process as a participant-report method, rather than observational methods, was employed. The strength would be attributed to the FPQ used in Study 2, which was based on dietary data from local Malay children. Thus, it is representative of the study population and improves the relevance of food items to the participants. Simplification of the FPQ Likert scale from 9-point to 5-point and appropriate interview duration of one hour permits sufficient qualitative data collection whilst ensuring minimal respondent burden [76,77].

Conclusion

These two exploratory studies were the first to explore Malay parents' perceptions of foods affecting their feeding practices and have provided key insights into children's food intake and factors

influencing these preferences. Overall, the knowledge on healthy and unhealthy foods, and feeding practices are similar among the parents. Snacks were the most preferred food group while legumes were the least preferred food group reported by parent-child pairs. There were a variety of factors influencing these preferences, but food sensory properties were the main contributor. The results provide a better understanding of the specific parental feeding practices, factors affecting the feeding practices, and barriers they faced when feeding their children. Parents should consider their children's sensory appeals when offering foods to assist the development of preferences for healthier options. These factors may inform targeted strategies in food preparation and feeding practices to encourage healthy eating for families.

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Authorship:

W.Y.Y, S.H.O, Y.D.L, P.L.Y. and L.K.Y contributed to the study design, data collection, data analysis and drafted and approved the final manuscript. W.Y.Y and S.H.O. provided research supervision, R.J. and N.N. assisted in the interpretation of data, critically reviewed and approved the final manuscript as submitted. All authors have contributed significantly to this manuscript.

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