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Associations of socio-demographic, environmental and parental factors, and nutritional status with fast food consumption among children aged 7-11 years old in Selangor

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ABSTRACT

Introduction: This cross-sectional study examined fast food consumption and its associated factors among primary school children in Selangor. **Methods:** A total of 221 children aged 7-11 years from six randomly selected primary schools in Petaling Perdana, Gombak, and Hulu Langat participated in this study. Parents completed a self-administered questionnaire on socio-demographic characteristics, exposure to fast food advertising, home food availability, parental stress, attitude towards fast food, intake of fast food, and two-day dietary record of children. Height and weight of children were obtained from their school SEGAK records. **Results:** Mean age of children was 9±1 years. Mean days per week of fast food consumption among children was 3.2±1.6 days, with 45.7% consuming fast food for >3 days/ week. Factors associated with frequent fast food consumption were children whose fathers had non-tertiary education levels (aOR 2.53, 95% CI 1.18–5.40), children with higher total screen viewing time (aOR 1.21, 95% CI 1.00–1.46), lower home food availability score (aOR 0.87, 95% CI 0.76–0.98), overweight and obese (aOR 2.38, 95% CI 1.23–4.60), requiring dietary improvements (aOR 4.03, 95% CI 1.36–11.98), and with poor diet quality (aOR 5.08, 95% CI 1.57–16.44). **Conclusion:** More than one third of the children consumed fast food for >3 days/week. Screen viewing time and home food availability should be considered when promoting healthy diets among children. Future research should consider other potential factors associated with children's consumption of fast food.

Keywords: diet quality, fast food consumption, home food availability, Malaysian children, screen viewing time

INTRODUCTION

Fast food is defined as a convenient food or food that is prepared and served quickly for consumption. Hamburgers, fried chicken, and French fries are examples of fast food favourites among children (Vaida, 2013). According to the Centers for Disease Control and Prevention (CDC, 2020), at least one-third (36.3%) of US children and adolescents had fast food on a given day during the years 2015-2018. The prevalence of fast food consumption varies significantly among ASEAN countries, including Malaysia (59.0%), Thailand (58.0%), Vietnam (53.6%), and Indonesia (9.5%)

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(Li *et al.*, 2020). Notably, at the regional level, Southeast Asia (17.7%) has the highest prevalence of fast food intake, with four or more days in a week among older children aged 12-15 years (Li *et al.*, 2020).

Frequent fast food consumption among children may lead to overweight and obesity as fast food is high in calories and poor in nutrients (Li *et al.*, 2020). Zhao *et al.* (2017) reported that children who consumed fast food for at least three times a week were 50% more likely to be obese than those who only consumed fast food less than once weekly. Since there is growing evidence that obese children have a higher chance of developing metabolic syndrome, promotion of a healthy diet is important for children as a public health and primary care prevention strategy (Man *et al.*, 2021).

Socio-demographic factors, such as child's age, sex, ethnicity, parental education and employment, as well as household income have been shown to be associated with fast food consumption among children (Zhao *et al.*, 2017). However, studies examining such associations are limited and have produced inconsistent findings. Zhao *et al.* (2017) reported that males had a higher frequency of fast food intake compared to females, while another study found that females had a higher frequency of fast food intake compared to males (Man *et al.*, 2021). Children from lower income households were reportedly more likely to consume fast food compared to nutrient-dense foods due to the relatively cheaper cost of fast food (Man *et al.*, 2021). On the other hand, children of employed parents with higher education levels frequently consumed fast food due to their parents' time constraints in preparing home-cooked meals (Gomes *et al.*, 2023).

A previous national survey reported a significant association between parental stress and parents' attitudes towards fast food with children's fast food intake (Singh & Mishra, 2014). Children of parents with high levels of perceived stress were more likely to consume fast food compared to those with low levels of perceived stress (Garber & Lustig, 2011). Besides, parents' attitudes towards fast food prices, health concerns, and convenience significantly impacted the frequency of fast food consumption among children. Parents who considered children's consumption of fast food to be socially acceptable were more likely to have children with higher fast food intakes (Singh & Mishra, 2014).

Environmental factors, which refer to the natural and socioeconomic conditions in which humans interact with each other, can affect eating behaviours and subsequently dietary intakes. Exposure to fast food advertising due to longer screen viewing time on television, computers, and other handheld devices has been linked to higher fast food intake among children (Kelishadi *et al.*, 2017). Home food availability is related to children's dietary habits, where higher availability of unhealthy foods and beverages (e.g., low nutrient-dense snacks and carbonated drinks) at home has been associated with frequent fast food consumption among children (Watts *et al.,* 2018). In addition, overweight and obese children are more likely to consume fast food as they are more alert towards food-related cues (e.g., fast food advertisement, sensory aspects of foods such as smell and appearance) that could trigger food desire or craving and subsequent consumption (Das, 2015). Poor diet quality in children is associated with frequent or higher intake of fast food too (Mumena *et al.*, 2022). Generally, poor diet quality is characterised by inadequate intake of fruits and vegetables and high intake of energy-dense foods and unhealthy fats (Man *et al.*, 2021).

Although studies have been conducted to understand the factors associated with fast food consumption, the focus has mainly been on adults and adolescents in Malaysia (Man *et al.,* 2021). To date, there is no local study on the associations between environmental and parental factors with fast food consumption among primary school-aged children (7-11 years old). As children have a higher likelihood to consume fast food nowadays (Man *et al.*, 2021), this study aimed to determine the associations of socio-demographic, environmental and parental factors, and nutritional status with fast food consumption among children aged 7-11 years in Selangor.

MATERIALS AND METHODS

Respondents

This cross-sectional study was conducted among children aged 7-11 years in six selected primary schools in Petaling Perdana, Gombak, and Hulu Langat districts, Selangor. Multistage sampling method was used in this study. A total of 662 primary schools in Selangor that met the inclusion criteria of a government school with multiracial composition and male and female students aged 7-11 years were included and divided into three groups, which were Sekolah Jenis Kebangsaan Cina (SJKC), Sekolah Kebangsaan (SK), and Sekolah Jenis Kebangsaan Tamil (SJKT). Two schools were then randomly selected from each group (n=6 schools). For each school, 1 class from Standard 1 to Standard 5 was randomly selected (n=5 classes/school) and all students in the randomly selected classes were invited to participate in this study. Children with autism and parents with mental or physical disabilities (e.g., depression, blindness) were excluded from the study. Children of single-parent households were also excluded from the study as these may have a different impact on the eating behaviours of children or family involvement in child feeding compared to two-parent households.

The sample size formula for correlational studies (Cole, 1997) was utilised to calculate the largest sample size required for the study. Using an adjusted design effect of 1.3, level of significance (α) of 0.05, power of 0.80, and expected response rate of 80%, a total of 199 respondents were required in this study. Research and ethics approval was obtained from the Ethics Committee for Research Involving Human Subjects in Universiti Putra Malaysia (JKEUPM) (Ref no: JKEUPM-2022-337). Study approval was also obtained from the Ministry of Education and the State Education Department of Selangor. An information sheet that explained about the study was distributed to both children and parents, and written informed consents were obtained from them.

Measurements

Data collection was conducted from September to November 2022. Permission was obtained from the selected six schools to distribute 300 questionnaires and consent forms to school children that were to be filled out by parents. Children were also required to indicate assent in the consent forms if parents agreed to participate in the study. The self-administered questionnaire consisted of seven sections: socio-demographic information, exposure to fast food advertising, home food availability, parental stress, parent's attitude towards fast food, children's fast food consumption, and 2-day dietary record. Children's weight and height were recorded from SEGAK records provided by the schools. The questionnaire and informed consent were collected from school children one week after distribution and follow-up was done for those who did not return the documents.

A total of 263 questionnaires were returned, with 42 respondents providing incomplete responses. Subsequently, only 221 respondents were included in the final analysis.

Socio-demographic information
The information included child's age, sex and ethnicity, parental education, employment, and household income.

Environmental factors
Total screen viewing time was used to assess the exposure of fast food advertising among children (Bernard *et al.*, 2017). This was an open-ended question where parents reported the number of hours their child watched three types of devices (television, computers, and other handheld devices) on an average weekday and weekend. A daily, weighted average for each device of screen viewing time was calculated [(weekday × 5 + weekend day × 2)/7] and summed up to obtain the total screen viewing time. A higher total screen viewing time (≥2 hours/day) indicated higher exposure to fast food advertising and higher consumption of fast food among children (Dalton *et al.*, 2017).

The availability of healthy and unhealthy snack foods at home was assessed using home food availability scales from the Project EAT Survey (2010). Parental report of home food availability was assessed with five items (fruits and vegetables, 100% fruit juice, potato chips or other salty snack foods, chocolate or other candy, soda pop), indicating how often these foods were available at home. The questions were based on a Likert-type response of "always", "usually", "sometimes", and "never". For fruits and vegetables and 100% fruit juice, a score of '3' was given to respondents who chose 'always', while a score of '0' was given to respondents who chose 'never'. Reversed scoring was given for potato chips or other salty snack foods, chocolate or other candy, and soda pop to indicate the availability of unhealthy snack foods at home. The score for each food item was summed up; the total score ranged from 0 to 15, whereby a higher score indicated higher availability of healthy snack foods at home.

Parental factors
Parental Stress Scale (PSS) was used to evaluate parental stress level in this study (Berry & Jones, 1995). The PSS is an 18-item self-reported questionnaire assessing parents' feelings about their parenting role, scored based on a 5-point Likert scale. It contains various measures of stress, including perceived work or family stress, loneliness, anxiety, and guilt. The response options ranged from 1 (strongly disagree) to 5 (strongly agree) and the item scores were added to indicate the degree of parental stress. The total score ranged from 18 to 90, with higher scores indicating greater stress. The PSS has demonstrated satisfactory levels of internal reliability (Cronbach's αlpha=0.84) and test–retest reliability [Intraclass Correlation Coefficient (ICC) = 0.85] (Berry & Jones, 1995).

Parent's attitude towards fast food was assessed through the adapted version of the parent's attitude questionnaire (Grier *et al.*, 2007). A five-point semantic differential scale, where 1= "negative" and 5= "positive" was used to assess the attitudes of parents towards fast food intake. Five key questions on parent's attitude towards fast food (enjoyable, wise, good, convenient, value for money) were asked, and respondents who rated 5 for each question were considered to have a positive attitude towards fast food consumption. The Cronbach's alpha score for the instrument was 0.69, which was considered acceptable (Grier *et al.*, 2007).

Children's nutritional status

Body weight and height of the children were obtained from SEGAK records in schools to determine body mass index (BMI). The children's BMI were computed using the World Health Organization (WHO) Anthro Software; body weight status was categorised based on the WHO BMI-for-age reference for children (aged 5 to 19 years), which classifies overweight as having a z-score >+1 standard deviation (*SD*), obesity as having a z-score >+2*SD*, thinness as having a z-score -3*SD* to -2*SD*, and severe thinness as having a z-score <-3*SD* (WHO, 2007).

A two-day (one weekday and one weekend) dietary record was utilised for assessing children's diet quality. Parents recorded their child's intake of foods and beverages as detailed as possible (e.g., specific types of food, cooking methods, serving sizes). Pictures of household measures were given to parents as references in estimating the quantity of foods and beverages consumed by their child. Nutritionist Pro™ Diet Analysis software (Axxya Systems, USA) was utilised to analyse the dietary records for energy, nutrients, and number of servings of food groups using the Malaysian Food Composition (MyFCD) database (MOH, 1997). The Malaysian Healthy Eating Index (MHEI), consisting of seven food groups and two nutrient components (percentage of energy from total fat and sodium) was used to determine the children's diet quality (Lee, Norimah & Safiah, 2011). The scoring methods for seven food groups were based on the recommended number of servings described in the Malaysian Dietary Guidelines for Children and Adolescents (MDGCA) (NCCFN, 2013), while the scoring methods for fat and sodium were done according to the Recommended Nutrient Intakes (RNI) for Malaysia (NCCFN, 2017). Each component in HEI had a score ranging from 0 to 10, where an intermediate score was calculated proportionately for in-between responses. Composite score in percentage was calculated based on the formula: (total score obtained from 9 components/maximum score of 90) × 100%. The possible composite score of HEI ranged from 0 to 100%, with higher scores indicating higher diet quality. A score >80% indicated good diet quality, scores 51% - 80% indicated needs of improvement, and scores <51% indicated poor diet quality (Lee *et al.*, 2011).

Dietary misreporting was determined based on energy intake/basal metabolic rate (EI/BMR) ratios (Black & Cole, 2000). Energy intake and BMR were determined from two-day dietary record and the WHO equation for children (WHO, 1985), respectively. EI/BMR values of <0.76, 0.76–1.24, and >1.24 indicated under-reporting, acceptable reporting, and over-reporting, respectively. In the study, 68 out of 221 children (30.8%) were identified as misreporters, with 13 under-reporting and 55 over-reporting. However, all data were considered acceptable to be included in the analysis (i.e., no outliers) as the reported energy intakes were within +2 and -2SD (Mccrory, Hajduk and Roberts, 2002).

Children's fast food consumption

Parents reported the number of days in a week (0 to 7 days) that their child had fast food from fast-food restaurants (Li *et al.*, 2020). Fast food was defined as convenience foods or prepared foods that are usually found at fast-food restaurants (Vaida, 2013). The frequency of fast food consumption in a week was further categorised into two groups: "consumed fast food for more than three days" and "consumed fast food for less than or equal to three days".

Statistical analysis

Statistical analysis was performed using the IBM SPSS Statistics version

26.0 (IBM Corp., Armonk, NY, USA). Frequencies and percentages were used to describe categorical variables, while means and standard deviations for continuous variables. Univariate and multiple logistic regressions were performed to determine the associations between independent variables and frequency of fast food consumption among children. The associations were presented using both crude and adjusted odds ratios (ORs), accompanied by their respective 95% confidence intervals (CIs). Variables from the univariate analysis with $p<0.25$ were included as predictors in the multivariate logistic regression. Statistical significance was set at $p<0.05$.

RESULTS

A total of 221 children (52.9% females and 47.1% males) participated in the study (Table 1). The mean age of children was 9±1 years, with 38.5% Chinese, followed by Malays (37.1%) and Indians (24.4%). Majority of the fathers (97.7%) and mothers (87.3%) had at least secondary education. Almost all fathers were employed (99.1%), while 61.5% of the mothers were employed. More than half of the respondents (60.2%) had a B40 monthly household income, which was less than RM4,850.00 per month. Mean BMI of the children was 17.9±2.2 kg/m^2, with about two-thirds (65.6%) having a normal weight, while 31.7% and 2.7% were overweight and obese, respectively.

Table 2 shows the mean and range of children's screen viewing time, home food availability, and parental stress. The total device-specific screen viewing time among children was 5.8±2.1 hours, with more than two-thirds (73.8%) of the children having high screen viewing time. Children had the highest mean hours of television screening time (2.5±1.4 hours), followed by the use of electronic gadgets (2.3±1.2 hours) and computers (2.0±1.1 hours) during weekend. Among the foods available at home, fruits and vegetables had the highest mean score (2.1±1.0), followed by soda pop (1.8±0.9), chocolate and candies (1.8±0.8), 100% fruit juices (1.7±1.0), and salty snacks (1.6±0.8). The total mean score for all foods was 8.86±3.18. The total score for parental stress ranged from 18 to 60, with a mean of 34.15±9.26.

Table 3 shows the food group intakes, diet quality score, and HEI composite score of children according to Healthy Eating Index (HEI). In this study, the mean number of servings for cereal and grains was 5.69±0.92, with nearly all children (99.1%) having achieved the recommended number of servings. As for meat, poultry, and eggs, as well as fish and seafood, the mean number of servings were 2.1±0.8 and 1.8±0.9, respectively, where 97.0% and 96.0% of the children achieved the recommended number of servings for these two food groups, respectively. The mean number of servings for vegetables and fruits intake were 1.6±1.0 and 1.0±0.8, respectively. Only a small proportion of children achieved the recommended daily servings for vegetables (19.9%) and fruits (31.2%). As for milk and dairy products, the mean number of servings was 1.6±0.9, with more than half (53.9%) of the children achieving the recommended number of servings per day. The mean number of servings for legumes was 0.3±0.5, with only 27.6% meeting the recommended daily servings. Slightly more than half (55.7%) of the children had ≤30% of energy from total fat and 45.7% consumed less than 2000 mg of sodium. Overall, the mean total MHEI score was 63.29±15.34, with most of the children having either poor diet quality (26.7%) or needing to improve their diet quality (59.7%).

Table 1. Characteristics of children (*N*=221)

Characteristic	*n (%)*	*Mean±SD*
Age (years)		9±1
7	31 (14.0)	
8	28 (12.7)	
9	34 (15.4)	
10	76 (34.4)	
11	52 (23.5)	
Gender		
Male	104 (47.1)	
Female	117 (52.9)	
Ethnicity		
Malay	82 (37.1)	
Chinese	85 (38.5)	
Indian	54 (24.4)	
Others	0 (0.0)	
Father's education level		
Tertiary education	138 (62.4)	
Secondary education	78 (35.3)	
Primary education	4 (1.8)	
No formal education	1 (0.5)	
Father's employment status		
Employed	219 (99.1)	
Unemployed	2 (0.9)	
Mother's education level		
Tertiary education	82 (37.1)	
Secondary education	111 (50.2)	
Primary education	23 (10.4)	
No formal education	5 (2.3)	
Mother's employment status		
Employed	136 (61.5)	
Unemployed	85 (38.5)	
Monthly household income[†]		
B40: less than RM4,850.00	133 (60.2)	
M40:RM4,850.00-RM10,959.00	61 (27.6)	
T20: More than RM 10,959.00	27 (12.2)	
Body mass index (BMI), kg/m^2[‡]		17.9±2.2
Severe thinness/ Thinness	0 (0.0)	
Normal weight	145 (65.6)	
Overweight	70 (31.7)	
Obese	6 (2.7)	

[†]Monthly household income level based on Department of Statistics Malaysia (2019).
[‡]BMI classification: Severe thinness <-3*SD*, Thinness -3 to -2*SD*, normal weight -2 to +1*SD*, overweight +1 to +2SD, obese >+2 SD (WHO, 2007)

Table 2. Mean and range of children's screen viewing time, home food availability, and parental stress (*N*=221)

Characteristic	*n (%)*	*Mean±SD (hours)*	*Min-max (hours)*
Child screen viewing			
Child spent watching television (videos, DVDs, PlayStation, Wii, Xbox) (hours/ weekday)		2.0±1.3	0-10
Child spent watching computer (desktop, laptop) (hours/ weekday)		1.7±0.9	0-6
Child spent watching electronic gadgets (handphones, tablet, Ipad) (hours/ weekday)		1.8±1.0	0-6
Child spent watching television (videos, DVD's, PlayStation, Wii, Xbox) (hours/ weekend)		2.5±1.4	0-10
Child spent watching computer (desktop, laptop) (hours/ weekend)		2.0±1.1	0-8
Child spent watching electronic gadgets (handphones, tablet, Ipad) (hours/ weekend)		2.3±1.2	0-8
Total device-specific screen viewing time (hours/day)†		5.8±2.1	1.29-15.43
Low (<2 hours/day)	58 (26.2)		
High (≥2 hours/day)	163 (73.8)		
Home food availability			
Fruits and vegetables‡		2.1±1.0	1-3
100% fruit juice‡		1.7±1.0	0-3
Potato chips or other salty snack foods‡		1.6±0.8	1-3
Chocolate or other candy‡		1.8±0.8	0-3
Soda pop‡		1.8±0.9	0-3
Home food availability total score‡		8.86±3.18	2-13
Parental stress			
Total parental stress scale (PSS) score§		34.15±9.26	18-60

†Higher total screen viewing time indicates higher exposure to fast food advertising and higher consumption of fast food among children (Dalton *et al.*, 2017).
‡4-point Likert scale [0= "never" to 3= "always"]; Higher score indicates higher availability of healthy foods at home (Total score ranges from 0-15).
§5-point Likert scale [1= "strongly disagree" to 5= "strongly agree"]; Higher score indicates higher stress (Total score ranges from 18-90).

Table 4 shows the parental attitude towards fast food and frequency of fast food consumption among children. The mean total score for attitude towards fast food was 15.69±3.91, with the highest and lowest scores related to convenience (4.27±0.99) and nutrition (2.68±1.06), respectively. The mean frequency for weekly fast food consumption among children was 3.2±1.6 days, where 45.7% of the children consumed fast food for >3 days a week.

Table 5 shows the factors associated with fast food consumption among children. Children whose fathers had non-tertiary education levels were more likely to consume fast food frequently (aOR 2.53, 95% CI 1.18–5.40) compared to fathers with tertiary education levels. For environmental factors, children with higher total device-specific screen viewing time (aOR 1.21, 95% CI 1.00–1.46) and less healthy foods available at home (aOR 0.87, 95% CI 0.76–0.98)

Table 3. Food group intakes, diet quality score, and Healthy Eating Index (HEI) composite score of children according to HEI (*N*=221)

HEI Component	Number of servings/day		% of children achieved recommended number of servings/day	Criteria for maximum score of 10	Diet quality score		
	Min-Max	*Mean±SD*			*n (%)*	*Min-max*	*Mean±SD*
Cereal and grains†	4-9	5.7±0.9	99.1%	4-7 servings		7.1-10.0	9.41±0.93
Vegetables†	0-3	1.6±1.0	19.9%	3 servings		0.0-10.0	5.37±3.17
Fruits†	0-2	1.0±0.8	31.2%	2 servings		0.0-10.0	3.29±4.54
Milk and dairy products†	0-4	1.6±0.9	53.9%	2 servings		0.0-10.0	5.57±4.79
Meat, poultry and egg†	0-4	2.1±0.8	97.0%	1-1 ½ servings		0.0-10.0	9.46±1.83
Fish and seafoods†	0-4	1.8±0.9	96.0%	1 serving		0.0-10.0	9.59±1.98
Legumes†	0-2	0.3±0.5	27.6%	1 serving		0.0-10.0	2.78±4.48
% of energy from total fat‡	24.2-38.0	30.1±4.0	55.7%	≤30% energy from fat		0.0-10.0	6.91±4.12
Sodium intake (mg)‡	1589.00-3650.60	2110.7±297.5	45.7%	≤2000mg		0.0-10.0	4.57±4.99
HEI composite score				-		30.2-100.0	63.29±15.34
Good diet quality					30 (13.6)	81.5-100.0	
Needs of improvement					132 (59.7)	51.1-79.6	
Poor diet quality					59 (26.7)	30.2-50.0	

†Number of servings based on recommendation of NCCFN (2013)
‡Recommended intake based on RNI (2017)
Note: Possible range of score for all HEI components: 0-10; HEI composite score: 0-100; Good diet quality: 81-100, Needs of improvement: 51-80, Poor diet quality: 0-50 (Rezali *et al.*, 2015)
Criteria for minimum score of 0 for all food groups: 0 serving; % of energy from fat: ≥35% of fat from total energy; sodium intake: ≥2200-2300mg (Rezali *et al.*, 2015)

Table 4. Parental attitude towards fast food and frequency of fast food consumption among children (*N*=221)

Characteristic	*n (%)*	*Mean±SD*	*Min-max*
Total score on attitude towards fast-food†		15.69±3.91	5-25
I think fast-food is not enjoyable/enjoyable		3.03±1.12	1-5
I think fast-food is foolish/ wise		2.72±1.17	1-5
I think fast-food is bad/ good		2.68±1.06	1-5
I think fast-food is inconvenient/ convenient		4.27±0.99	1-5
I think fast-food is waste of money/ value for money		2.99±1.11	1-5
Frequency of fast-food consumption (weekly)		3.2±1.6	0-7
≤3 days	120 (54.3)		
>3 days	101 (45.7)		

†5-point semantic differential scale [1= "negative" to 5= "positive"]; Higher score indicates more positive attitude on fast food consumption among children (Total score ranges from 5-25).

were associated with frequent fast food consumption. Higher BMI (aOR 1.56, 95% CI 1.24–1.96) or being overweight/ obese (aOR 2.38, 95% CI 1.23–4.60) and having a poor diet quality (aOR 5.08, 95% CI 1.57–16.44) were associated with frequent fast food consumption among children.

DISCUSSION

The present study showed that 45.7% of children consumed fast food for more than three days weekly. A study in China reported that 35.3% of primary school children had fast food for one to two times a week, while only 2.8% had fast food for more than two times weekly (Zhao *et al.*, 2017). In Malaysia, Man *et al.* (2021) reported that 69.3% of nationally representative children and adolescents aged 10-18 years had fast food for one to three days weekly; 17.2% did not consume fast food at all in a week, while another 13.5% had fast food for at least four days in a week. Over the years, there has been an increasing trend of fast food intake among children in Malaysia, especially in urban areas due to the popularity and variety of food choices (Man *et al.*, 2021). In the present study, fast food intake was also found to be prevalent among urban children, attributed to the high availability and accessibility of fast food.

In the present study, children of fathers with non-tertiary education levels were more likely to consume fast food for more than three days a week compared to children of fathers with tertiary education levels. However, Gomes *et al.* (2023) showed that maternal education was more likely than paternal education to influence dietary habits of children, where children of women with tertiary education levels had a higher intake of fast food than those of women with secondary education or less. The observed finding could be due to the likelihood of less educated fathers having lower nutrition knowledge and a lack of awareness on child nutrition-related issues, which could contribute to unhealthy eating habits among children, such as frequent fast food consumption (Gomes *et al.*, 2023).

The present finding was consistent with a study among Iranian children reporting that those with excessive screen time (for more than four hours daily) on watching television and using computers had higher odds of consuming fast food (OR 1.53; 95% CI 1.4–1.7) (Kelishadi *et al.*, 2017). The observed lower screen viewing time among children during

Table 5. Factors associated with fast food consumption among children (*N*=221)

Variable	*Fast-food Consumption >3 days/ week (n=221)*			
	Univariate logistic regression		*Multiple logistic regression*	
	Crude OR (95% CI)	*p*	*Adjusted OR (95% CI)*	*p*
Age (years)	1.30 (1.06, 1.59)	0.013		
7-9	1			
10-11	2.23 (1.29, 3.87)	0.004*		
Gender				
Male	1			
Female	1.73 (1.02, 2.96)	0.044*		
Ethnicity				
Malay	1			
Chinese	0.55 (0.30, 1.01)	0.054		
Indian	0.37 (0.18, 0.76)	0.007*		
Father's education level				
Tertiary	1		1	
Non-tertiary	1.60 (0.93, 2.77)	0.092	2.53 (1.18, 5.40)	0.020*
Father's employment status				
Employed	1		-	-
Unemployed	0.00 (0.00, 0.00)	0.999	-	-
Mother's education level				
Tertiary	1			
Secondary	1.86 (1.04, 3.43)	0.038*		
Primary/No formal education	2.44 (1.02, 5.84)	0.046*		
Mother's employment status				
Employed	1			
Unemployed	1.28 (0.74, 2.20)	0.382	-	-
Monthly household income				
Low(<RM4,850.00)	1			
Middle/ High (>RM4,850.00)	1.61 (0.93, 2.79)	0.087		
Total screen viewing time (hours/ day)	1.29 (1.12, 1.49)	<0.001*	1.21 (1.00, 1.46)	0.046*
Low (<2 hours/day)	1			
High (≥2 hours/day)	2.56 (1.35, 4.88)	0.004		
Home food availability total score	0.84 (0.77, 0.92)	<0.001*	0.87 (0.76, 0.98)	0.026*
Parental stress	1.00 (0.97, 1.03)	0.948	-	-
Attitude towards fast food	1.15 (1.07, 1.24)	<0.001*		
Body mass index	1.65 (1.40, 1.94)	<0.001*	1.56 (1.24, 1.96)	<0.001*
Normal weight	1		1	
Overweight/Obese	3.51 (1.97, 6.27)	<0.001*	2.38 (1.23, 4.60)	0.010*
Diet quality	0.96 (0.94, 0.98)	<0.001*		
Good diet quality	1		1	
Needs of improvement	4.57 (1.65, 12.65)	0.003*	4.03 (1.36, 11.98)	0.012*
Poor diet quality	6.35 (2.14, 18.86)	0.001*	5.08 (1.57, 16.44)	0.007*

Reference group: fast food consumption ≤3 days/ week
*Significant at $p<0.05$

weekdays in the present study could be due to schooling, co-curriculum activities, tuition, and homework. A systematic review of observational studies concluded that higher screen time viewing, particularly TV watching, was associated with adverse dietary outcomes among children. The review found that children tended to consume unhealthy foods (e.g., high in fat and sugar, low in fruits and vegetables) as they were exposed to such food advertisements, where this exposure can shift their preferences away from healthier food choices (Shqair *et al.*, 2019). Hence, it is important to restrict children's accessibility to screen-based entertainments to reduce exposure to unhealthy food advertising and at the same time, promote a healthier diet to children.

The present study showed that children with more healthy food choices at home were less likely to consume fast food frequently, which is consistent with a previous study that reported an association between higher availability of unhealthy foods (e.g., high-fat and high-sugar foods) at home with snacks and fast food consumption (Watts *et al.*, 2018). The availability of healthy foods at home significantly influences children's food choices, as this will promote healthy eating behaviours, such as consuming more nutritious foods. However, the high availability of healthy foods at home does not always reflect a healthy home food environment and healthy eating behaviours among children. The current study found that despite having high availability of fruits and vegetables at home, there is a need to improve the diet quality of children. This resonates with a previous study showing that even with the presence of healthy foods at home, there were barriers that hindered children from eating nutritious foods (e.g., fruits and vegetables), such as difficulties in preparing and cooking these foods according to parents' and children's food preferences (Gomes *et al.*, 2023). In addition, children may perceive that fruits and vegetables are not appealing. Due to the lack of taste affinity for certain foods, children may have a low intake of fruits and vegetables despite these foods being available at home (Magalhães *et al.*, 2022). Nevertheless, establishing a healthy home food environment through the availability of nutritious foods at home is necessary to promote the development of healthy dietary behaviours among children.

In the present study, a higher BMI or being overweight/obese was significantly associated with frequent fast food consumption among children. A previous study also indicated that children with overweight or obesity were more likely to consume fast food compared to normal weight children (Reyes-Olavarría *et al.*, 2020). In the USA, individuals with overweight or obesity were associated with fast food intake of at least 3 times in a week (OR 3.36, 95% CI 1.77 - 6.4) (Reyes-Olavarría *et al.*, 2020). This could be due to resistance to hormones, such as leptin, insulin, and others, which regulate appetite in individuals with overweight or obesity, resulting in heightened feelings of hunger and cravings for foods that are highly palatable and calorie-dense, such as fast food (Das, 2015). Additionally, children with overweight or obesity are more likely to recognise the logos of fast-food outlets compared to logos of non-fast-food establishments. This may trigger food desire and subsequent fast food intake among overweight or obese children (Das, 2015).

In the present study, majority of the children (86.4%) had either poor diet quality or the need to improve their diet quality, which is comparable to a previous study (Chang, 2020). Chang (2020) reported that 69.8% and 28.3%

of the children aged 7-12 years needed to improve their diet quality and had poor diet quality, respectively. Children with poor diet quality are more likely to consume fast food (Mumena *et al.*, 2022). In Saudi Arabia, lower diet quality was associated with frequent fast food intake among children and adolescents (aged 11-18 years) (Mumena *et al.*, 2022). A local study among children aged 10-18 years reported that those who had an excessive intake of cereal products (>11 servings/day) and meat/poultry/eggs (>2 servings/day) tended to consume fast food frequently. In addition, those who had insufficient intakes of vegetables (<3 servings/day) also had a higher likelihood of having fast food (Man *et al.*, 2021). In general, poor diet quality among children was attributed to inadequate consumption of fruits and vegetables, along with excessive intake of unhealthy fats (Man *et al.*, 2021). The present study provided meaningful information on the association between diet quality and fast food intake among children aged 7-11 years, as no study has been conducted to examine this relationship among children in Malaysia using MHEI.

The present study found no significant association between parental stress and fast food intake among children. This could be due to other factors, such as time constraints to prepare home-cooked meals and family preferences, that contributed to frequent fast food intake among children (Horning *et al.*, 2017). Although a previous study reported a significant association between parental attitude towards fast food and fast food intake among children (Grier *et al.*, 2007), the present study did not observe such an association. The non-significant association in the present study indicated that the frequency of fast food intake among children was not significantly influenced by parents' positive perceptions of fast food.

There are several limitations to the present study. The cross-sectional design of the study did not allow for inference of causal relationships between independent variables and fast food consumption among children. As the study was conducted in Selangor, the findings cannot be generalised to children residing in other states in Malaysia, as there may be differences in socio-demographic and environmental factors across states. Furthermore, the two-day dietary record filled in by parents might have been biased in terms of food selection and measurement of foods taken by children since the dietary assessment was done without real-time guidance from researchers. The lack of objective measurement for screen time viewing could have also influenced the accuracy of the study findings. Finally, there could be other potential factors that the study did not examine in relation to fast food consumption among children. Despite these limitations, the present study had provided an insight into the factors associated with fast food consumption among urban primary school children.

CONCLUSION

The mean frequency for fast food intake among children was 3.21±1.64 days a week, with 45.7% consuming fast food for >3 days/week. Factors associated with frequent fast food consumption (>3 days/week) were fathers with non-tertiary education levels, less healthy foods available at home, higher total device-specific screen viewing time, higher BMI, and poor diet quality of children. Understanding the factors related to fast food consumption could facilitate strategies to improve dietary habits of children. Since excessive fast food intake can adversely affect children's present and future health, promoting healthy eating to primary school children

is warranted. Parents and teachers play an important role in shaping healthy dietary habits in children by serving as role models, both at home and at school. Relevant ministries and health professionals can ensure better nutrition for children through school health policy, educational curriculum, and school health programmes. It is recommended that future studies be extended to other urban areas of Malaysia and include more factors, such as nutrition knowledge and fast food accessibility, that may be associated with fast food intake among children. Additionally, the cause-and-effect relationships between independent variables and fast food intake, as well as fast food intake and health outcomes should be investigated through longitudinal and case-control studies.

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Authors' contributions

Chong SH, conceptualised and designed the study, carried out data collection, data analysis and interpretation, and prepared the manuscript draft; Zalilah MS, conceptualised and designed the study, advised on data analysis and interpretation, assisted in manuscript preparation, and finalised the manuscript.

Conflict of interest

All authors declare no conflict of interest.

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