Original Article

Breakfast Eating Pattern and Ready-to-Eat Cereals Consumption among Schoolchildren in Kuala Lumpur

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Abstract

***Background*: Studies from the West have demonstrated that ready-to-eat cereals (RTECs) are a common form of breakfast and more likely to be consumed by children. This study aimed to investigate the breakfast eating pattern and RTECs consumption among schoolchildren in Kuala Lumpur.**

***Methods:* In this cross-sectional study, a total of 382 schoolchildren, aged 10 and 11 years old, were recruited from seven randomly selected primary schools in Kuala Lumpur. Information on socio-demographics, breakfast eating patterns, and perceptions of RTECs and dietary intake (24-hour dietary recalls) were obtained.**

***Results:* Among the respondents, only 22% of them consumed breakfast on a regular basis. The most commonly eaten food by children at breakfast was bread (27.2%), followed by biscuits (22.2%) and RTECs (20.5%). The majority of them (93%) reported that they consumed RTECs sometimes during the week. Chocolate RTECs (34.1%), corn flake RTECs (30.3%), and RTECs coated with honey (25.1%) were the most popular RTECs chosen by children. Respondents who consumed RTECs showed a significantly higher intake in calories, carbohydrate, vitamin A, vitamin B1, vitamin B2, vitamin B3, folate, vitamin C, calcium, iron, and fibre ($P < 0.05$), compared to those who skipped breakfast and those who had breakfast foods other than RTECs.**

***Conclusion:* The lower levels of breakfast consumption among schoolchildren in Kuala Lumpur need serious attention. RTEC is a nutritious food which is well accepted by a majority of the schoolchildren in Kuala Lumpur. Nutrition intervention should be conducted in the future to include a well-balanced breakfast with the utilisation of RTECs for schoolchildren.**

Keywords: *breakfast, cereals, children, calorie, Malaysia*

Introduction

Consumption of breakfast is a dietary pattern which contributes positive benefits in nutrition and cognitive function (1). It is correlated with better food choice and consequently better intake of essential nutrients (2). Regular breakfast consumption takes advantage of physiologic mechanisms that are hypothesised to increase the satiety and reduce the risk of childhood obesity (3). The association between breakfast and health benefits may be due to the particular food consumed at breakfast. Despite breakfast being often referred to as the most important meal of the day (4), breakfast skipping is still common among children and adolescents, with higher rates shown in girls, older age groups and lower income families (5). The decreasing trend of regular breakfast consumption among children has been demonstrated by studies from the United States (6), Hong Kong (7), and Malaysia (8). On top of that, one study reported that breakfast was the most frequently missed meal among Malaysian children (8). Children who skip breakfast do not, on average, make up the nutrient deficits at other meals during the day (9). Numerous reasons have been cited by breakfast skippers, including lack of hunger, diets to lose weight, or a lack of time (10). One strategy to increase the consumption rate of breakfast is to promote ready-to-eat cereals (RTECs), which are palatable, convenient, nutrient-dense foods that do not require complicated preparation (11). Children who have regular RTECs intake are least likely to skip breakfast and put themselves at risk of obesity (1).

RTECs are defined as any processed cereal that can be eaten without further preparation. Cereal is a convenient and easy-to-prepare breakfast option, which provides whole grains and dietary fibre (12). RTECs also contribute in increasing milk intake and in improving the intake

of dietary nutrients, such as calcium, folate, iron, zinc, vitamin A, vitamin B6, thiamine, riboflavin, niacin, magnesium, and vitamin C (13), which may protect against several diseases. Previous studies have shown an inverse correlation between body mass index (BMI) z-scores and being overweight and the number of days of RTECs consumption (14).

RTECs are a common form of breakfast in the diet of children from the West, especially in the United States (4). It is an important contributor of whole grain, which provides approximately 30% of the daily whole grain intake in the United States diet (15). Recently, a trend towards RTECs consumption is increasing in Malaysia; 60.6% of children from the Klang Valley have been reported to prefer various types of cereal, such as RTECs with milk (16). Several studies have reported on the daily eating habits of school-aged children in Malaysia; however, no published study has reported on the breakfast eating habits and RTECs consumption among Malaysian schoolchildren. Hence, this study was carried out to investigate the breakfast consumption patterns and RTECs consumption among schoolchildren in Kuala Lumpur.

Materials and Methods

Research design

A list of primary schools in Kuala Lumpur was obtained from the Kuala Lumpur Federal Territory Education Department consisting of 149 national primary schools, 33 Chinese primary school, and 15 Tamil primary schools. Three national primary schools, two Chinese primary schools and another two Tamil primary schools were randomly selected to participate in this study. A total of 382 schoolchildren aged 10 and 11 years were selected from seven primary schools through a stratified random sampling method for this cross-sectional study. Kuala Lumpur is the capital of Malaysia and is heavily urbanized and populated. Formal permission to conduct the study in the selected schools was obtained from the Ministry of Education, Malaysia, and Kuala Lumpur Federal Territory Education Department. The study protocol was reviewed and approved by the UKM Research Ethics Committee. Parental consent was obtained for all children prior to participation. Verbal consent was obtained from the children too before the study began in order to enable us to acquire anthropometric measurements and 24-hour diet recall and to administer the questionnaires. All interviews with the children and anthropometric measurements were taken by a trained investigator who was working on her research project.

Sampling method

According to the Kuala Lumpur Federal Territory Education Department, a total of 43452 pupils were studying in Standard four and five. The estimated sample size required for calculation based on the formulation by Krejcie and Morgan (17) is as follow:

$$n = [X^2 NP (1-P)] / [d2 (N-1) + X^2P (1-P)],$$

Where:

n = estimated sample size
X^2 = table value of chi square for 1 degree of freedom at the desired confidence level of 95% = 3.841

N = the population size = 43452

P = population proportion
= 0.5 (this would provide the maximum sample size)

d = degree of accuracy expressed as a proportion = 0.05

Thus,

$$n = [3.841 (43452) 0.5 (1-0.5)] / (0.05)^2 (43452-1) + 3.841 (0.5) (1-0.5)] = 381.$$

Based on a 10% drop-out rate, the estimated sample size for this study was 423. A total of 430 children within the inclusion criteria were invited to participate in this study. Inclusion criteria were children of both sexes aged 10–11 years and from Malay, Chinese or Indian ethnicities. Exclusion criteria were children with mental or physical disabilities. However, only 382 children successfully completed the study. The non-response rate was mainly due to incomplete questionnaires, absence from school or parents refusing to give consent.

Anthropometric measurements

The body weight of each child was measured twice using a calibrated TANITA digital scale Model 300GS (TANITA, Cranlea & Co. Birmingham, England) and recorded to the nearest 0.1kg. Each child was weighed barefooted with minimal clothing and in a pre-prandial state. The height of the child was measured twice using a portable stadiometer (Leicester, UK) attached

to a smooth wall and recorded to the nearest 0.1cm. The average value of the two readings was reported. The BMI classification of children was based on the World Health Organization (WHO) guideline (2007).

Assessment of dietary intake

Children lack the necessary cognitive skill in answering food frequency questionnaires (18), whereas the process of completing food records may change their eating behaviour (19). Hence, 24-hour diet recall is the most appropriate dietary intake method for children (20). Children were asked to recall all the food and drink they had consumed on two non-consecutive days, including one school day and one weekend day. Dietary recall was carried out with extensive probing, using table ware items, such as bowls, spoons, glasses, and dishes in commonly used sizes. Food models and pictures of common foods were used to assess food intake and portion sizes. It was completed using estimated weights of food, household measures and portion size. The information received was carefully checked by the trained investigator in order to avoid omitted or misreported data. Nutrient values for each food item were obtained from the Nutrient Composition of Malaysian Foods and food product labels. Total energy and nutrient intakes from two days diet recalls were calculated by Nutritionist Pro software (Axxya Systems, United States). The means of these values were used in the analysis.

Questionnaire

Questionnaires were adapted with permission from the Nutritional Status and Dietary Habits of Primary Schoolchildren in Peninsular Malaysia year 2001–2002 study (UKM-Nestle project) (21): one for the parents and one for the children. The questionnaires were prepared in Malay, Mandarin and Tamil versions The parents' self-administered questionnaires covered three aspects: (i) the socio-demographic status of the family, (ii) the child's breakfast eating habits, and (iii) the child's RTECs eating habit and preferences. These aspects involved detailed questions on breakfast habits, food choices for breakfast on commonly eaten foods in Malaysia, decision making related to RTECs purchased, preference type of RTECs purchased, frequency of RTECs purchased and quantity of RTECs purchased. The children' questionnaire consisted of detailed questions on preference in terms of the type of breakfast, reasons for skipping breakfast, RTECs consumption time relating to frequency, preference type of RTECs and quantity of RTECs eaten.

Design of breakfast categories

According to National Health and Nutrition Examination Survey III (NHANES III), breakfast was defined as any beverage or food consumed in a meal occasion named by the children as breakfast (English) or desayuno (Spanish). Children that took no food or beverage at breakfast, excluding water, were categorized as breakfast skippers.

Researchers divided the breakfast categories into three groups which consisted of breakfast skipper, consume RTECs as breakfast and consume other food as breakfast except RTECs. A child was assigned to a breakfast category according to two days of 24-hour dietary recalls. Children who consumed RTECs for breakfast according to diet recalls were assigned to the "consume RTECs as breakfast" category. Children who took no food or beverage at breakfast and children who had breakfast foods other than RTECs according to two days of 24-hour dietary recalls were assigned to the "breakfast skipper" and "consume other food as breakfast except RTECs" categories, respectively.

Statistical analyses

All statistical analyses were performed using the SPSS version 21.0 (IBM SPSS Statistics, 2013). Data was entered, cleaned, and checked before data analysis. Each variable was examined for normality distribution using the Kolmogorov Smirnov test, and non-parametric tests were used when the data was not normally distributed. The distribution of the data was assessed by descriptive analysis and presented as a median with interquartile range or percentage of prevalence. The Kruskal-Wallis, and Mann Whitney U test were applied to determine the calorie, macronutrients, and micronutrients intake among three different groups of breakfast eating habits (breakfast skipper, consume RTECs as breakfast, consume other food as breakfast except RTECs). A two-sided P value of < 0.05 was considered statistically significant.

Results

Children socio-demographics

The socio-demographic characteristics of the children are listed in Table 1. A total of 382 schoolchildren aged 10 and 11 years or studying in Standard 4 and Standard 5 participated in this study, of which 160 were boys and 222 were girls. The schoolchildren were from all the three main ethnicities in Kuala Lumpur, with 40.1%

Malays, 30.9% Chinese, and 29.1% Indians. More than half of them belonged to the category of normal weight (70.4%), followed by overweight/ obesity (18.6%), and underweight (11%). The majority of their parents had a secondary level of education (mother: 49.3%; father 52.1%) and belonged to the medium income group, earning less than RM 5600 per month (36.2%), based on the classification by the Malaysian Economic Planning Unit (2010).

Table 1: Socio-demographic and characteristics of the children (n = 382)

Variables	n (%)
Age	
10 years old	183 (47.9)
11 years old	199(52.1)
Gender	
Male	160 (41.9)
Female	222 (58.1)
Ethnicity	
Malay	153 (40.1)
Chinese	118 (30.9)
Indian	111 (29.1)
Monthly family income	
> RM5600	58 (20.6)
RM2300–RM5600	102 (36.2)
< RM2300	84 (29.7)
Non- response	38 (13.5)
Education level of mother	
Postgraduate	5 (1.8)
Graduate	49 (17.4)
Certificate/ diploma	61 (21.6)
Secondary school	139 (49.3)
Primary school	28 (9.9)
Education level of father	
Postgraduate	12 (4.2)
Graduate	38 (13.5)
Certificate/ diploma	56 (19.9)
Secondary school	147 (52.1)
Primary school	29 (10.3)
BMI-for-age status	
Underweight	42 (11.0)
Normal	269 (70.4)
Overweight/ obesity	71 (18.6)

Breakfast eating pattern

It was found that out of a total of 382 children, less than half of the children (22%) consumed breakfast on a regular basis (daily), whereas the rest of the children (78%) had irregular breakfast intake. The main barrier provided to explain why children were not eating breakfast regularly was due to stomach discomfort (39.3%). The second most commonly cited reason was that they overslept (16.1%), followed by no food provided (16.1%), poor appetite (6.0%), and not being hungry (4.7%). The most commonly eaten food by children at breakfast was bread (27.2%), followed by biscuits (22.2%), RTECs (20.5%), cakes (8.2%), eggs (7.3%), coconut rice (6.0%), roti canai (4.6%), and noodles (the least at 4.0%) (Figure 1).

RTECs intake habit

Among the children, 93% of the respondents reported consuming RTECs sometime during the week. The three most common RTECs chosen by the study respondents were Chocolate RTEC (34.1%), corn flake RTEC (30.3%), and RTEC coated with honey (25.1%). The majority of them (73.7%) consumed RTECs with milk. Almost half the children (45.4%) reported that they consumed RTECs two to three times per week, whereas 19.6% of them had RTECs regularly (daily basis) and 13.4% of them consumed RTECs four to six times per week (Figure 2). Most of the parents (41.2%) purchased RTECs for their children with the reason that RTECs are a healthy food. The second most common reason was that RTECs are a favourite food of their children (32.0%), followed by the reasons that RTECs enhance satiety (14.8%), and are time saving (12.1%). Table 2 shows the calorie, macronutrients and micronutrients intake among three different groups of breakfast categories. These three different groups consist of breakfast skipper, consume RTECs as breakfast and consume breakfast foods other than RTECs.

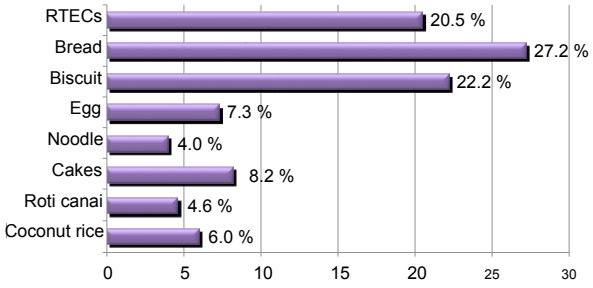

Figure 1: Breakfast food choices of the children (n = 382).

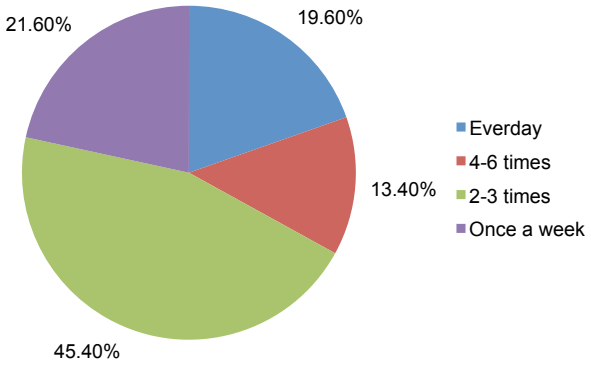

Figure 2: Frequency ready-to-eat cereals consumption of the children in a week (n = 382).

RTECs consumption was significantly associated with increased intakes of essential nutrients. Children who consumed RTECs as breakfast had significantly increased intakes of breakfast calories ($P < 0.001$), vitamin B1 ($P = 0.001$), vitamin B2 ($P < 0.001$), vitamin B3 ($P = 0.040$), folate ($P = 0.003$), and calcium ($P = 0.010$) compared to those who skipped breakfast. In addition, children who consumed RTECs as breakfast had significantly increased intakes of breakfast calories ($P = 0.040$), total calorie intake ($P = 0.007$), carbohydrates ($P = 0.038$), fibre ($P = 0.022$), vitamin A ($P < 0.001$), vitamin B1 ($P < 0.001$), vitamin B2 ($P < 0.001$), vitamin B3 ($P = 0.001$), vitamin C ($P = 0.014$), folate

Table 2: Calorie, macronutrients and micronutrients intake among three different groups of breakfast habit of study children (n = 382)

	Breakfast Skipper (n= 51)	Consume RTECs As Breakfast (n=59)	Consume Other Food As Breakfast Without RTECS (n= 272)
	median (IqR)		
Calorie (kcal)			
Breakfast calorie	0 (95.31)[a]	383 (257.69)[b]	314 (166.90)[c]
Total daily calorie	1643 (556.09)	1729 (569.05)[d]	1619 (376.72)[e]
Macronutrients			
Carbohydrate (g)	213.00 (98.41)	246.83 (86.40)[f]	219.66 (69.58)[g]
Protein (g)	62.30 (32.05)	67.19 (20.81)	61.12 (21.03)
Fat (g)	62.73 (20.28)[h]	56.03(18.92)	53.61 (22.77)[i]
Micronutrient			
Fiber (g)	7.12 (5.10)	7.88 (4.58)[j]	6.82 (4.53)k
Vitamin A (µg)	4099.00 (11951.30)[m]	5191.23 (3963.71)[n]	3005.67 (6641.67)[q]
Vitamin B1(mg)	0.98 (0.83)[r]	1.57 (0.72)[s]	1.11 (0.57)[t]
Vitamin B2 (mg)	1.35 (0.96)[u]	2.36 (1.12)[v]	1.60 (0.85)[w]
Vitamin B3 (mg)	15.10 (6.49)[x]	23.03 (8.81)[y]	16.58 (10.47)[z]
Vitamin C (mg)	89.40 (93.11)	104.44 (84.44)[aa]	80.04 (96.79)[bb]
Vitamin E (mg)	3.80 (3.83)	3.94 (2.97)	3.35 (2.78)
Zinc (mg)	4.61 (2.69)	5.50 (5.10)	5.20 (3.25)
Folat (µg)	162.00 (130.62)[cc]	224.61 (141.35)[dd]	144.79 (92.43)[ee]
Calcium (mg)	598.90 (389.40) [ff]	851.11 (350.75)[gg]	660.00 (451.61)[hh]
Iron (mg)	16.45 (9.20)[ii]	17.67 (6.77)[jj]	13.27 (6.65)[kk]
Selenium (µg)	32.68 (31.41)[mm]	34.27 (28.82)	42.50 (28.90)[nn]

Abbreviation: RTECs = ready to eat breakfast cereal
Kruskal Wallis and Mann Whitney U test were applied.
Tests show:
a vs b, $P < 0.001$; b vs c, $P = 0.040$; a vs c, $P < 0.001$; d vs e, $P = 0.007$; f vs g, $P = 0.038$; h vs I, $P = 0.003$; j vs k, P = 0.022; m vs q, $P = 0.006$; n vs q, $P < 0.001$; r vs s, $P = 0.001$; s vs t, $P < 0.001$; u vs v, $P < 0.001$; v vs w, $P < 0.001$; x vs y, $P = 0.004$; y vs z, $P = 0.001$; aa vs bb, $P = 0.014$; cc vs dd, $P = 0.003$; dd vs ee, $P = 0.001$; ff vs gg, $P = 0.010$; gg vs hh, $P = 0.001$; ii vs kk, $P = 0.043$; jj vs kk, $P < 0.001$; mm vs nn, $P = 0.029$

(P = 0.001), calcium (P = 0.001), and iron (P < 0.001) compared to those who had breakfast foods other than RTECs (Table 2).

Discussion

In this present study, only 22% of the children consumed breakfast on a regular basis (daily), which is far lower compared to several previous studies which showed 80.9% from the Netherlands (22), 44.9% from Selangor, Malaysia (23), and 50% from Kelantan, Malaysia (24). This study shows that breakfast consumption habits among schoolchildren in Kuala Lumpur need serious attention. Breakfast skipping was significantly correlated with body mass index. Children who frequently skip breakfast intake have a greater risk of excessive body adiposity, which may contribute to a higher risk of being obese and related metabolic consequences compared to those taking breakfast regularly (24). In regards to the overwhelming prevalence of childhood obesity, health promotion efforts should be aimed at stimulating daily breakfast consumption among schoolchildren, especially in Kuala Lumpur.

The common barriers provided to explain why children were not eating breakfast regularly were stomach discomfort, lack of time due to oversleeping, no food provided, poor appetite and not being hungry. These findings are in line with other findings from Korea (25), Selangor, Malaysia (26), and Turkey (27). These barriers may be reduced by promoting easy-to-prepare breakfast options or alternate breakfast choices which can be eaten without prior preparation, such as bread, biscuits, and RTECs. In addition, these examples were the three most common foods chosen by the study children, if given a choice for breakfast.

A total of 93% of the study children reported eating RTECs sometimes during the day. This figure is higher than the 87% reported from a previous study in Malaysia (21). A majority of the children consumed RTECs with milk, which is consistent with the finding of a study from Selangor in Malaysia, which showed that 60.6% of their study respondents liked to eat cereal with milk (16). It is a good sign that RTEC is one of the breakfast choices enjoyed and consumed by children in Malaysia nowadays. The present study showed that children who consumed RTECs as breakfast had significantly increased intakes of vitamin A, vitamin B1, vitamin B2, vitamin B3, vitamin C, folate, calcium, iron, and fibre compared to those who skipped breakfast and those who ate breakfast foods other than RTECs. This is consistent with a study conducted in San Antonio, United States (28). The total daily calories of children who consumed RTECs were higher than those of breakfast skippers or those who consumed breakfast foods other than RTECs; this is also in line with the findings from a study from California (29). Daily breakfast consumption was associated with better food choice, such as whole grain RTECs and fruits and vegetable, consequently resulting in a better intake of essential nutrients (2). RTECs are fortified with minerals and vitamins, including iron, folic acid, vitamin D, and calcium (30), and it is possible that the consumption of RTECs provides micronutrients that children might not ordinarily consume over the course of the day, and the consumption of RTECS may facilitate the intake of other healthy foods during breakfast and displace unhealthy foods (1). In addition, children who like to eat cereal tend to consume more whole grains, which are higher in fibre (1). Besides, children in this study who consumed RTECs as breakfast were shown to have lower fat intake compared to those who skipped their breakfast, although the difference was not significant (P > 0.05). This finding is in line with a study from the United States (1), which showed that consumption of RTECs as breakfast might bring down the consumption of high-fat foods such as breakfast meats and burgers. So far, there is no clear overview of intervention programs to stimulate breakfast intake, in particular, for RTECs in Malaysia. Future health promotion efforts could be targeted to increase breakfast consumption, especially RTECs.

The outcomes of the study provide a clear picture of the breakfast eating pattern, RTECs consumption and the nutritional intake among Malaysian schoolchildren. It can be useful for future researchers who wish to conduct a breakfast intervention studies, particularly related to RTECs among schoolchildren in Malaysia. The limitation of this study was that we could not determine the specific types of RTECs children consumed in terms of whether the cereals were generic or original brand versions, which tend to be fortified with minerals and vitamins. Also, the children might have under-reported or over-reported their dietary intake.

Conclusion

The outcome of the study demonstrated that the low level of breakfast consumption among schoolchildren in Kuala Lumpur needs serious attention. RTECs were shown to be well accepted

as a breakfast choice, and they are enjoyed by children not only from the West but also in Malaysia. It is a nutritious food which is able to meet nutrient needs for health and growth. A nutrition intervention programme should be established in the future to promote a well-balanced breakfast through the utilization of RTECs, and it may be a way to favourably influence eating patterns in both normal and overweight children. Healthcare professionals should provide information through nutrition programs to reinforce the public importance of breakfast consumption, as well as to promote healthy breakfast choices, including RTECs with minimal added sugar and low fat milk, to optimize nutrient intake value and to assure that the children are well fed both from the standpoint of quantity and quality.

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Conflict of Interest

None.

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Authors' Contributions

Conception and design, critical revision of the article for the important intellectual content, final approval of the article, obtaining of funding, administrative, technical or logistic support: RAT
Analysis and interpretation of the data: KHC, SNAJ
Provision of study materials or patient: RAT,KHC, SNAJ
Collection and assembly of data: SNAJ
Drafting of the article: KHC

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