Mutritional status, academic performance and parental feeding practices of primary school children in a rural district in Kelantan, Malaysia

Lee YY.*, Wan Abdul Manan WM.

Program in Nutrition, School of Health Sciences, Universiti Sains Malaysia Health Campus Kelantan, Malaysia

ABSTRACT

Introduction: The increasing burden of undernutrition and overnutrition at both ends of the nutrition spectrum in children are often accompanied by adverse consequences in school performance. Children with poor nutritional status had lower scores on tests of cognitive functioning, lower activity levels, and poorer psychomotor development, whereas severe malnutrition often leads to impaired psychological and intellectual development.

Purpose: To investigate the relationship between children's nutritional status, their socioeconomic background as well as their parents's beliefs, attitudes and practices in child feeding with their academic achievement in school.

Materials and methods: Anthropometric measurements and socioeconomic background information were collected from systematically selected school children aged 10 to 12 years old (n=309), while information regarding parental child feeding practices were obtained via a set of self-administered questionnaire.

Results: Based on the World Health Organization (WHO) growth charts, 10.7% and 18.1% of the children were thin and overweight or obese, respectively. Results also showed that children's nutritional status, household socioeconomic background and parental child feeding beliefs and practices were interrelated with the children's academic achievement.

Conclusion: These findings justified the need for relevant health and nutrition interventions in schools, especially the children of bottom billion community living in the rural areas.

Key words: Nutritional status; school children; child feeding practices; academic achievement.

*Corresponding author:
Program in Nutrition, School of Health Sciences,
Universiti Sains Malaysia Health Campus, 16150 Kota Bharu, Kelantan Malaysia
Tel.:+609-767 7648 / +6016-980 6206
Fax: +609-764 6641
e-mail: happyiyi86@gmail.com

INTRODUCTION

School age is one of the most active growing stages for a child, involving both physical and mental development. Undernutrition among school age children is a major public health problem globally, particularly in Asia and Africa [1].

The prevalence of underweight, stunting and thinness among school age children in South-East Asia region were 39%, 29% and 34%, respectively, and 21%, 22% and 36% in the Africa region, respectively [2]. Meanwhile, the prevalence of overweight and obesity in South-East Asia and Africa was 13% and 7%, respectively [2].

The nutritional status of children often deteriorates during school age years and can only be partially reversed in later life [1]. The Third National Health and Morbidity Survey (NHMS III) conducted in Malaysia reported that the national prevalence of underweight children between the age of 1 to 18 years old was 13.2%, while the prevalence of stunting and wasting was 15.8% and 10.4%, respectively. On the other hand, the prevalence of overweight in this age group was 5.4% [3].

Proper attention should be given to this group of children because their performance will impact the socioeconomic development of a country [4]. Unsatisfactory nutritional status during school age were also linked to low enrolment in school, higher school dropout rate, absenteeism and low performance in school [5].

A study by Anuar Zaini, Lim, Low and Harun found that both urban and rural underweight primary school children aged 9 to 10 years old in Selangor performed significantly poorer in all academic subjects (Malay Language, English, Mathematics and Science) compared to normal weight, overweight and obese children [6]. On the other hand, another study by Ong and colleagues did not find any association between poor nutritional status and school performance (Malay Language and Mathematics) among a sample of 7 to 8 year old primary school children in Kuala Lumpur [7].

Parents play a vital role in helping their children achieve and maintain healthy body weight [8]. Child feeding beliefs, attitudes and practices of parents determine children's eating habits and influence the development of their self-regulation of energy intake and satiety cues [9].

Besides child feeding practices, family environment including the availability of food items and parents' eating behaviours could also influence children's food preferences [10].

The objectives of this study was to determine the association between parental child feeding behaviours, attitudes and practices with children's nutritional status and school performance of school age children aged 10 to 12 years old. Findings from the present study will be useful in implementing suitable prevention and intervention strategies to promote optimal feeding practices among parents and to improve the health and nutrition of children.

MATERIALS AND METHODS

Study Location and Background

This study was conducted in eight systematically selected primary schools located in the district of Bachok in Kelantan, a state located in the east coast of Peninsular Malaysia. The ethical approval to conduct the study was obtained from Universiti Sains Malaysia's Human Research Ethics Committee. Permission to conduct this study in primary schools was granted by Malaysia's Ministry of Education, Kelantan State Education Department and the district's education office. Informed consent forms were then distributed to parents whose children were identified to take part in the study.

Only Malaysian primary school children aged 10 to 12 years old during the day of data collection, had no illnesses, physical or mental disabilities, and had informed consent from their parents were enrolled as participants. Consent was also acquired from the children for their permission for researchers to obtain their anthropometric measurements. The children's achievements in 5 academic subjects were obtained from the children's personal files at the schools' administration office and from their class teachers, respectively. Parents' child feeding behaviours, attitudes and practices were queried using a self-administered questionnaire.

Study design and sampling method

This is a cross-sectional study that involved school children aged 10 to 12 years old. Sampling was based on the formula by Daniel with estimated 25.2% of prevalence of underweight primary school children in Kelantan (error of 5% and confidence level of 95%) [11,12]. A total of 309 systematically selected children and their parents successfully participated in the study. Data collection took place from June to November 2009.

Sociodemographic information

The children's sociodemographic background information was obtained from their personal files. These include the child's birth date, sex, ethnicity, religion, number of siblings, parents' age, level of education, occupation and monthly income.

Anthropometric measurements

The body weight of the children was measured to the nearest 0.1kg using a SECA digital weighing scale (Model 880, Hamburg, Germany) by trained researchers. Their height was measured using a SECA Bodymeter (Model 208, Hamburg, Germany) to the nearest 0.1cm. They were dressed in their school uniforms and without shoes. All measurements were taken twice and the mean value was used for data analysis. The body mass index (BMI) of each child was calculated using the standard formula BMI = weight (kg)/height^2(m). The weight-for-age Z-scores, height-for-age Z-scores and BMI-for-age Z-scores (age and sex specific) were generated by the World Health Organization (WHO) AnthroPlus Version 1.0.3 (Geneva, Switzerland, 2007). The nutritional status of the children was determined in reference to the age and sex-specific growth charts [13]. A child was considered as undernourished or thin if his BMI-for-age Z-score was below -2 standard deviation (SD) from the reference median. Meanwhile, children with BMI-for-age Z-scores above +1 SD and +2 SD from the reference median were categorized as overweight and obese, respectively.

Parental beliefs, attitude and practices in child feeding

The Child Feeding Questionnaire (CFQ) adapted from Birch and colleagues was used to measure and assess self-reported child feeding beliefs, attitude and practices among parents [14]. Consisting of seven subscales measured using a 5-point Likert-type scale, the CFQ had been used in different settings and was cross-validated in different parental samples. The *perceived responsibility*, *perceived parent weight* and *perceived child weight* subscales measure parental beliefs in child feeding. The *parents' concern about child weight* measure parental attitude in child feeding, whereas the *restriction (of food)*, *pressure to eat* and *monitoring* subscales measure parental child feeding practices. The translated and validated *Bahasa Malaysia* version of the CFQ had a Cronbach Alpha value of 0.77 and was also reliable to be used among the Malaysian population. All the questionnaires and forms were coded to ensure the anonymity of the children and parents that were involved in the study.

School performance

The children's examination marks in five academic subjects, namely Malay Language I (comprehension skills), Malay Language II (writing skills), English Language, Science and Mathematics were obtained from their respective class teachers. The maximum marks that can be awarded to each academic subject are 100 marks. The children's overall academic performance is the average marks of all 5 subjects tested in two different school examinations. The average marks were commonly used to determine their position in class. For the present study, their performance was divided into quartiles to avoid discrimination of "good" and "poor" students.

Statistical analysis

The data obtained was analysed using IBM SPSS Statistics Version 19.0 (SPSS Inc., Chicago, IL, USA). The children's and their parents' sociodemographic profiles were described using descriptive statistics. Independent samples *t*-test was utilized to compare the mean scores of variables between two groups of children with different nutritional status. Meanwhile, Pearson's correlation test was performed to assess the linear relationship between two continuous variables. Linear regression was applied to estimate the relationship between one dependent variable and other independent variables. The level of significance was set at $p<0.05$.

RESULTS

A total of 309 school children participated in the study. Their mean and median values for the children's age were 10.8 (0.8) years and 11 years, respectively. More than half of the households (56.3%) had 5 to 9 children. A majority of the children's fathers (66.7%) and mothers (69.3%) achieved secondary school level education. The mean total household monthly income of both parents was reported to be RM1,252.90 (RM1,638.50) with median value of RM500.00. However, about 72.5% of the households lived with an estimated total household monthly income of less than RM 1,000.00 per month (1 USD ≈ RM3.10) (Table 1).

The mean values of the children's anthropometric measurements, namely body weight, height, BMI, BMI-for-age Z-scores and height-for-age Z-scores, as well as their nutritional status are summarized in Table 2.

The findings indicated that 10.7% of the children were categorized as thin, whereas another 11.0% and 7.1% of them were found to be overweight and obese, respectively.

Table 1. Sociodemographic information of the children and their parents.

Variables		Total n (%)
Sex	Boys	131 (42.4)
	Girls	178 (57.6)
Age (years)	10	119 (38.5)
	11	122 (39.5)
	12	68 (22.0)
Number of siblings	< 5	110 (35.6)
	5 – 9	174 (56.3)
	10 – 14	25 (8.1)
Total household monthly income (RM)	< 500.00	120 (38.8)
	500.00 – 999.99	104 (33.7)
	1,000.00 – 1,499.99	16 (5.2)
	1,500.00 – 1,999.99	12 (3.9)
	> 2,000.00	57 (18.4)
Father's education level	Did not attend school	2 (0.7)
	Primary school	65 (21.0)
	Secondary school	198 (66.7)
	College/University	32 (10.4)
Mother's education level	Did not attend school	7 (2.3)
	Primary school	51 (16.5)
	Secondary school	214 (69.3)
	College/University	33 (10.7)

Table 2. Anthropometric measurements of the children.

Anthropometric measurements	Mean (SD)		
	Boys (n=131)	Girls (n=178)	Total (n=309)
Weight	33.89 (9.69)	33.85 (8.79)	33.87 (9.16)
Height	138.53 (7.49)	139.71 (7.55)	139.21 (7.53)
BMI	17.37 (3.48)	17.18 (1.53)	17.26 (3.50)
BMI-for-age Z-scores	-0.16 (1.51)	-0.39 (1.34)	-0.29 (1.42)
Height-for-age Z-scores	-0.76 (1.02)	-0.87 (0.96)	-0.82 (0.98)

Table 3 shows the mean scores of parents' beliefs, attitudes and practices in child feeding, children's overall academic performance in quartiles, and also the mean scores of each individual academic subject. The *pressure to eat* (child feeding practices) item had the highest mean score (M=3.80, SD=0.73). On the other hand, the *perceived child weight* (child feeding beliefs) item had the lowest mean score (M=2.90, SD=0.36). In terms of overall academic performance, more than half of the children (56.6%) had scores within the range of 51 to 75 marks (3rd quartile). The children had the highest mean score in the Malay Language I subject (M=69.24, SD=18.85),

while the lowest mean score in the Mathematics subject (M=48.18, SD=20.41). Table 4 shows that girls (M=58.23, SD=15.88) scored significantly higher (p<0.01) compared to boys (M=51.79, SD=18.56) academically. Meanwhile, school children whose fathers (M=69.60, SD=10.39, p<0.001) and mothers (M=65.07, SD=14.67, p<0.01) attained college or university education had significantly better academic performance compared to their peers whose fathers (M=53.87, SD=17.24) and mothers (M=54.36, SD=17.30) attained only secondary level education or less.

Table 3. Nutritional status of the children.

Nutritional status (WHO BMI-for-age Z-scores)	Boys n (%)	Girls n (%)	Total n (%)
Thinness (< -2 SD)	13 (4.2)	20 (6.5)	33 (10.7)
Normal (>-2 SD to +1 SD)	89 (28.8)	131 (42.4)	220 (71.2)
Overweight (> +1 SD)	17 (5.5)	17 (5.5)	34 (11.0)
Obese (> +2 SD)	12 (3.9)	10 (3.2)	22 (7.1)

Table 4. Distribution of parents' scores in child feeding beliefs, attitudes and practices and children's academic performance.

Variables	n (%)	Mean (SD)
Parental child feeding beliefs, attitudes and practices		
Perceived responsibility		3.68 (0.91)
Perceived parent weight		3.05 (0.36)
Perceived child weight		2.90 (0.36)
Concern about child weight		3.46 (0.82)
Restriction (on food)		3.60 (0.64)
Pressure to eat		3.80 (0.73)
Monitoring		3.56 (0.97)
Children's overall academic performance (marks)		55.50 (17.33)
< 25 marks (1st quartile)	24 (7.8)	
25 – 50 marks (2nd quartile)	76 (24.6)	
51 – 75 marks (3rd quartile)	175 (56.6)	
> 75 marks (4th quartile)	34 (11.0)	
Children's academic performance according to subjects (marks)		
Malay Language I		69.24 (18.85)
Malay Language II		59.19 (20.50)
English		51.49 (15.90)
Science		53.02 (17.58)
Mathematics		48.18 (20.41)

Results show that children's age ($r=0.152$, $p<0.01$) and total household monthly income ($r=0.306$, $p<0.001$), as well as their weight ($r=0.130$, $p<0.05$) and height ($r=0.192$, $p<0.01$) had significant positive correlation with the children's overall academic performance (Table 5).

For parental child feeding belief, attitude and practices, four items, namely *perceived parent weight* ($r=0.177$, $p<0.01$), *perceived child weight* ($r=0.169$, $p<0.01$), *restriction (on food)* ($r=0.163$, $p<0.01$) and *pressure to eat* ($r=0.136$, $p<0.05$) also had significant positive correlation with children's overall academic performance.

Table 5. Children's academic performance by sex, parents' education level and breakfast habits.

Variables	%	Academic Performance Mean (SD)	95% Confidence Interval	p-value[a]
Sex				
Boys	42.4	51.79 (18.56)	-10.30, -2.57	<0.01
Girls		58.23 (15.88)		
Father's education level				
Secondary level and below	89.6	53.87 (17.24)	-21.87, -9.61	<0.001
College/University		69.60 (10.39)		
Mother's education level				
Secondary level and below	89.3	54.36 (17.30)	-16.89, -4.53	<0.01
College/University		65.07 (14.67)		
Frequency of breakfast consumption				
Daily	57.2	56.50 (16.99)	-6.28, 1.55	0.237
≤ 3 days a week		54.15 (17.76)		

[a] Independent *t*-test, **$p<0.01$, ***$p<0.001$

Table 6 and 7 show the simple and multiple linear regression analyses on the associated factors of academic performance with sociodemographic information, anthropometric measurements, and child feeding beliefs, attitudes and practices, respectively. Using the multiple linear regression analysis, only the variables of sex (Adjusted b=0.235, p<0.001), age (Adjusted *b*=0.174, p<0.01), total monthly household income (Adjusted b=0.312, p<0.001), as well as *perceived child weight (*Adjusted b=0.144, p<0.01) and *pressure to eat* (Adjusted b=0.119, p<0.05) (child feeding beliefs and practices) were found to be significantly associated with the children's academic performance.

Table 6. Correlation between academic performance with sociodemographic information, anthropometric measurements, and parental child feeding beliefs, attitudes and practices.

Variables	Academic performance	p-value[a]
Sociodemographic background		
Age**	0.152	<0.01
Number of siblings	-0.078	0.174
Total household monthly income***	0.306	<0.001
Anthropometric measurements		
Weight*	0.130	<0.05
Height**	0.192	<0.01
BMI	0.088	0.121
WHO BMI-for-age Z-scores	0.030	0.595
WHO height-for-age Z-scores	0.078	0.174
Parental child feeding beliefs, attitudes and practices		
Perceived responsibility	0.048	0.396
Perceived parent weight**	0.177	<0.01
Perceived child weight**	0.169	<0.01
Concern about child weight	-0.045	0.432
Restriction (on food)**	0.163	<0.01
Pressure to eat*	0.136	<0.05
Monitoring	0.032	0.579

[a] Pearson's correlation test, * p<0.05, ** p<0.01 , *** p<0.001

Table 7. Associated factors of academic performance with sociodemographic information, anthropometric measurements and child feeding beliefs, attitudes and practices using simple linear regression analysis.

Variables	Crude regression coefficient[a] (95% CI)	p-value	R^2
Sociodemographic information			
Sex*	0.184 (0.102, 0.468)	<0.01	0.034
Age*	0.152 (10.182, 10.748)	<0.01	0.023
Number of siblings	0.078 (5.374, 7.189)	0.174	0.006
Total monthly household income***	0.306 (-938.905, 236.036)	<0.001	0.094
Anthropometric measurements			
Weight*	0.130 (39.767, 54.540)	<0.05	0.017
Height*	0.192 (-41.193, 29.479)	<0.05	0.037
BMI	0.088 (38.221, 57.699)	0.121	0.008
WHO BMI-for-age Z-scores	0.030 (53.625, 57.593)	0.595	0.001
WHO height-for-age Z-scores	0.078 (54.096, 59.150)	0.174	0.006
Parental child feeding beliefs, attitudes and practices			
Perceived responsibility	0.048 (44.076, 60.283)	0.396	0.002
Perceived parent weight**	0.177 (12.706, 45.795)	<0.01	0.031
Perceived child weight**	0.169 (17.518, 47.870)	<0.01	0.028
Concern about child weight	0.045 (50.452, 67.226)	0.432	0.002
Restriction (on food)**	0.163 (28.814, 50.704)	<0.01	0.027
Pressure to eat*	0.136 (33.129, 53.608)	<0.05	0.018
Monitoring	0.032 (46.168, 60.954)	0.579	0.001

[a] Simple linear regression method applied. * p<0.05, **p<0.01, *** p<0.001

DISCUSSION

Findings from the current study showed that 71.2% of the children had normal nutritional status, while another 10.7%, 11.0% and 7.1% of them were classified as thin, overweight and obese, respectively [15]. Compared to a study by Moy and colleagues in Kuala Lumpur which detected a 15.9% prevalence of underweight among Malay school children and adolescents, the prevalence of undernutrition in this study is substantially lower. Another study by Anuar Zaini and his team investigated the nutritional status of both urban and rural primary school children in Selangor reported that a majority of the children had normal BMI (76.3%), while 1.2%, 16.3% and 6.3% of them were found to be underweight, overweight and obese, respectively [16]. Che Asiah and colleagues revealed that more than 20% of Malay school-age children in two districts in Kelantan were severely underweight and stunted [12]. On the other hand, 10.8% and 24.8% of Chinese primary school children in the Kota Bharu district in Kelantan were underweight and overweight or obese, respectively [17]. A recent study carried out on Malay school age children in the urban district of Kota Bharu, Kelantan also discovered that 27.5% of the children were underweight and 13.1% were either overweight or obese [18]. Many factors have contributed towards the improvement of nutritional status among children and these include socioeconomic development in recent years, knowledge empowerment of women as primary caregivers through improved education, as well as the effectiveness of health and nutrition intervention programs.

Unsatisfactory academic performance during the early years of schooling are said to persist to the teenage years and these students were generally found to have a higher school dropout rate and were more prone to behavioural misconduct and juvenile delinquency at an older age [19]. In the local scenario, academic performance, even in primary school level is often a concern for both students and parents because it is linked to successful entrance into elite or boarding schools for secondary school education, followed by entrance into universities. The present study showed that the children's sociodemographic background influenced their academic performance in school. A comparison of the children's academic performance according to their sex revealed that the girls had significantly better academic performance compared to boys. This is consistent with other local studies [7,20,21] where boys were found to have poorer academic performance in schools. Older children also had significantly better academic performance in this study.

Results have shown that total household monthly income was significantly positive correlated with the children's overall academic performance. Poor socioeconomic condition of the family is one of the determinants for poor school performance among children [22]. In addition, children whose fathers and mothers had undergone college or university education also had better academic performance compared to their counterparts whose parents did not have any tertiary education. It could be postulated that parents with higher levels of education may be able to develop better understanding to information about child nurturing and in guiding their children with school work. Higher levels of maternal education were also linked to longer and more exclusive breastfeeding which may be beneficial for their children and contributed to greater intakes of protein and micronutrients [23]. Moreover, when resources are limited, parents with higher levels of education might be more capable of maximizing existing resources in the environment for survival, adapting to limited food choices and develop feeding strategies for their children [24]. Boey et al. and Anuar Zaini et al also reported that primary school children in Malaysia from the lower income group had significantly poorer academic performance [6,20].

In terms of breakfast consumption, there was no significant difference in the academic performance among the children who consumed breakfast daily and three or less than three days in a week in the present study. Similarly, in another study in New Zealand, daily school breakfast provision in school did not have a significant effect on children's academic performance [25]. Nevertheless, Grantham-McGregor highlighted the advantages of breakfast consumption among primary school children, especially on school performance [26].

There were also significant positive correlations between the children's weight and height with their overall academic performance. Anuar Zaini and colleagues also documented a similar coherent argument where underweight primary children scored weaker in academic performance compared to normal weight, overweight and obese children [6]. In another study, a group of primary school children's weight-for-age Z-scores was reported to be significantly correlated with their academic performance [21].

Children's knowledge of food and diet was established during childhood and adolescence and could be influenced by various interconnected factors including parental influence [27,28]. Moreover, children's food intake could also be affected by their parents' beliefs, attitudes and practices in child feeding because parents' decision on the choices of food served at home or eaten outside, allocation of

portion sizes and meal times often creates the environment of eating as a family and affects the children's dietary habits [14]. There were significant positive correlations between the children's overall academic performance with four items from the CFQ, namely the *perceived parent weight*, *perceived child weight*, *restriction (on food)* and *pressure to eat*. Children whose parents perceived themselves and their children as heavier (higher body weight) had better overall academic performance. Meanwhile, children whose parents practiced more food restrictions on their children such as limiting sweets, snacks and other foods which are high in fat and sugar had better overall academic performance. On the other hand, children whose parents put more pressure on their children to eat or to forcing them to finish their food during mealtimes apparently performed better in school. This finding was consistent with a local study by Mohd Nasir and colleagues [29]. Parents frequently restrain their children's dietary intake by limiting unhealthy food items and insisting that the children increase their consumption of more healthful food items such as fruits and vegetables [10]. A previous study reported that healthy eating behaviours were positively associated with stronger cognitive ability among young children of Hispanic origins in Los Angeles [30]. Nevertheless, after the multiple linear regression analysis, only the *perceived child weight* and *pressure to eat* items were found to be significantly associated with the children's overall academic performance in school.

The limitations of this study are that it only includes school children and their parents from a rural district in Malaysia and its small sample size. However, it is important to note that the results from this study is able to provide some information about the nutritional status of children living in the rural areas, as well as the relationship between nutritional status and parental child feeding beliefs, attitudes and practices with academic performance among school children in this country.

CONCLUSIONS

The children's academic performance was found to be interrelated to their household socioeconomic status, age and sex, as well as parental child feeding practices, namely the *perceived child weight* and *pressure to eat* items. Findings suggest that various stakeholders should be actively involved in promoting healthy eating and lifestyle among children to ensure optimal nutritional status and in reducing socioeconomic inequalities among the

people. In addition, parents should also become exemplary role models and apply optimal feeding practices on their children because parents have a crucial influence on food choice as they influence the availability of food at home.

Authors' Contribution
Both authors contributed to the conception and study design and writing of the paper. The corresponding author is in charge of data collection and data analysis.

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