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Nutritional Status, Dietary Intake Patterns and Nutrition Knowledge of Children Aged 5-6 Years Attending Kindergartens in the Klang Valley, Malaysia

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ABSTRACT

Introduction: Early childhood is a period during which many factors influence the development of lifelong eating habits. This study aimed to assess the nutritional status of young children and to determine factors related to eating habits**. Methods**: A total of 992 children aged 5-6 years attending kindergartens that participated in the Bright Start Nutrition programme in the Klang Valley were included in the study. Anthropometric measurements were taken and body mass index (BMI) calculated. A questionnaire to assess the children's nutrition knowledge was administered through interviews, while their mothers self-administered another set of questionnaires regarding knowledge, attitude and practice on nutrition. **Results:** The mean BMI was 15.7±2.7kg / m² in boys and 15.4±2.4kg / m² in girls. Based on the WHO 2007 growth reference, the prevalence of overweight and obesity were 9.1% and 9.3%, respectively; while the prevalence of thinness and stunting were 5.8% and 3.9%, respectively. Most of the children consumed breakfast (86.4%), lunch (94.1%) and dinner (93.4%) daily. The majority liked fruits (95.1%), snacks (93.8%), Western fast food (93.3%) and milk (90.8%), while less than two-thirds (65.1%) liked vegetables. The mean nutrition knowledge scores for the children and mothers were 73.2±9.8% and 60.2±18.8%, respectively. Maternal nutrition knowledge was correlated positively with children's vegetable intake ($r=0.111$, $p<0.05$) and negatively with snack intake ($r=-0.134$, $p<0.05$). **Conclusion:** These results showed a higher prevalence of overweight and obesity than underweight and thinness among the urban young children studied. As mother's nutrition knowledge was found to exert a positive influence on children's eating habits, it is important to provide nutrition education to both mothers and children when conducting intervention programmes.

Keywords: Childhood nutrition, food habits, preschoolers, nutrition knowledge, maternal influence

INTRODUCTION

Childhood is the time when individuals begin to establish lifelong eating habits. During the first five years of life, children are learning what, when and how much to eat based on the transmission of cultural and familial beliefs, attitudes and practices

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surrounding food and eating (Savage, Fisher & Birch 2007). In fact, healthy eating patterns initiated early in life may not only benefit immediate health but can also influence food preference later in life; furthermore, poor eating patterns in childhood have been associated with several health problems in adulthood (Nicklas *et al.*, 2004).

Birch (1998) stated that children's eating habits can be estimated based on food preferences, which may increase by repeated exposure. Usually children like to eat foods with high energy density, especially foods that are high in fat and sugar (Looney & Raynor 2011). A study by Pang *et al.* (2003) found that 90% of Malaysian preschoolers liked to eat sugary confectionaries, Western fast foods, ready-to-eat grains and flour-based foods. On the other hand, studies have reported that children do not like to eat vegetables (Anzman-Frasca *et al.*, 2011).

A child's eating habits are most influenced by the family during the young preschool age (Curtis, Stapleton & James 2011). However, parents become less influential when children begin school, and children's eating habits are then influenced by kindergarten teachers, peers and the media. For example, peers can act as role models to children as they eat their meals together (Hendy & Raudenbush 2000).

The American Dietetic Association reported that fat consumption, especially saturated fat intake, has increased, while there is a deficiency in the consumption of foods high in calcium and fibre over the years (ADA 2008). Vereecken, Keukelier & Maes (2004) also found that only a few pre-schoolers achieved intake recommendations for fruits, vegetables, grains, bread and milk, whilst most preschoolers over-consumed sugary snacks and drinks. As a consequence, these eating habits contribute to the rising prevalence of childhood obesity.

In Malaysia, there has been many studies reporting the dietary intake and patterns of school-aged children and adolescents, but few studies have reported the eating habits of those in the preschooler age group. It is thus important to understand the dietary intake and other factors related to the preschooler's nutritional status in order that nutrition education or intervention programmes may be more comprehensive and successful. Hence, this study was carried out to assess the eating habits of Malaysian preschoolers and the association of these habits with their body weight status and nutrition knowledge.

METHODS

This was a cross-sectional study conducted in the year 2003 at 72 private kindergartens in the Klang Valley that participated in the Bright Start Nutrition programme, a toddler and preschool nutrition education programme for kindergarten operators, parents and children. The Bright Start Nutrition was conducted by the Nutrition Society of Malaysia between the years 2002 and 2005 in collaboration with the Malaysian Paediatric Association, Kindergarten Association of Malaysia and the Association of Registered Childcare Providers Malaysia, and supported by Dutch Lady Nutrition Centre.

Subjects and sampling

A list of kindergartens in the Klang Valley was obtained from the Kindergarten Association of Malaysia. They were classified into 5 areas in Kuala Lumpur and 3 areas in Petaling district, and 9 kindergartens from each area were randomly selected to participate in this study.

Sample size was calculated using a formula by Lwanga & Lemeshow (1991) for estimating a population proportion with specified relative precision formula. Based on an estimated 3.3% of overweight from a study of preschoolers in Subang Jaya (Norimah & Lau, 2000), the sample size calculated was 919 children with a

confidence interval of 95% and relative precision of 3.5%. After taking into account an additional 10% of expected dropouts, the final sample size was 1010.

Parents and guardians of all children within the inclusion criteria were invited to participate in the study. Inclusion criteria were children of both sexes aged 5-6 years, and from Malay, Chinese or Indian ethnicities. Exclusion criteria were children with physical or mental disabilities. Parental consent was obtained for all preschool subjects prior to participation.

In addition, the mothers of the preschoolers were also invited to participate by answering a set of questionnaires for mothers. Preschoolers whose mothers answered the questionnaire were interviewed based on a set of questionnaires for children. All interviews with the preschoolers and anthropometric measurements were conducted by a trained nutritionist who was working on her research project for a Master degree.

Anthropometric measurements

Anthropometric measurements including body weight, height, mid-upper arm circumference (MUAC), triceps and subscapular skinfold thickness were taken and recorded for all subjects. Standardised techniques were used as described by Lohman, Roche & Martorell (1988). All readings were taken and recorded in duplicate.

Body weights were measured using a SECA digital scale Model 871 (SECA, Germany) and recorded to the nearest 0.1 kg; the scale was calibrated with a known weight before each use. The subjects were asked to stand on the scale without shoes, with hands relaxed by the side and in light clothing (kindergarten uniform). Height was measured using a SECA bodymeter Model 208 (SECA, Germany) attached to a smooth wall and recorded to the nearest 0.1 cm. The subjects were asked to stand as erect as possible, looking straight ahead and with their heels on the ground. They were measured without shoes, and with the back of their shoulders, buttocks and heels touching against the wall. Body mass index was calculated. The WHO growth reference chart for children aged 5-19 years old (WHO, 2007) was used to classify the children into BMI categories and to define stunting.

MUAC was measured using a measuring tape. The distance between the acromion and the olecranon of the right arm was measured and the midpoint was marked. MUAC was measured with the measuring tape at the midpoint of the upper arm, with the subject's arm relaxed and the elbow extended. The circumference was recorded to the nearest 0.1 cm. The triceps and subscapular skinfold thickness were measured on the right side of the body. Measurements were made to the nearest 0.1 mm using Harpenden skinfold callipers.

Questionnaires

Two sets of questionnaires designed by the researchers were used: one for the mothers and one for the preschoolers. The questionnaires were prepared in English and translated into Malay and Mandarin. Questionnaires were pre-tested for clarity and ease of comprehension prior to being applied in the study.

The mothers self-administered questionnaire covered four aspects, namely (i) the child's meal patterns and preferences; (ii) the child's eating habits; (iii) knowledge, attitude and practice (KAP) as it relates to nutrition; and (iv) the socio-economic status of the family. Child's meal patterns, eating habits and preferences comprised detailed questions on each meal and snack time relating to frequency, reasons for skipping meals, types of food, decision making related to types of food served and quantity of food eaten.

The preschoolers' questionnaire on nutrition knowledge, attitudes and food preferences was completed by the researcher through face-to-face interviews with the children using pictures as visual aids. Questions on nutrition knowledge included food groups and the function of each food group based on the food guide pyramid. Children's attitudes were assessed by asking them if they thought certain foods were 'good for you' or not, or 'do not know'. Food preferences and habits involved asking them if they 'liked' certain foods, and whether they 'always', 'sometimes' or 'never' consumed it.

For nutrition knowledge, each correct answer was given 1 mark while each wrong or 'do not know' answer scored 0. The total score was then calculated as a percentage and categorised into one of three categories as suggested by Thombs, Mahoney & McLaughlin (1998): satisfactory (≥75%), moderate (50–74%), and not satisfactory (<50%).

Data analysis

The classification of the children into BMI-for-age and height-for-age categories was done with the Anthro software version 3.2.2 (WHO, 2011). The Statistical Package for Social Science (SPSS) version 15 was used to analyse the data. Descriptive statistics were used to calculate the mean, percentage, standard deviation and confidence interval. All variables were checked for normality using Kolmogorov-Smirnov, and non-parametric tests were used when the data was not normally distributed. The Mann-Whitney U test was used to determine the difference between the physical characteristics of boys and girls, and the Kruskal-Wallis test was used to determine the differences in nutrition knowledge between ethnicities. The Spearman's rank correlation test was used to determine correlations between socio-demography and frequency of eating away from home, as well as nutrition knowledge with frequency of food intake.

RESULTS AND DISCUSSION

Demographic and socio-economic background

A total of 992 preschoolers participated in the study, of which 484 were boys and 508 were girls. The preschoolers were from all three main ethnicities in the Klang Valley, with 42.2% Malays, 43.9% Chinese, 12.3% Indians and 1.6% others. A total of 394 preschoolers whose mothers answered the questionnaires were also interviewed by the researcher for their food preferences, nutrition knowledge and attitudes.

The socio-demographic background of the 394 mothers who answered the questionnaires is shown in Table 1. The majority of them were from household sizes of 4-6 persons (82.7%), with household incomes of below RM5000 (70.5%), and secondary schooling or higher (95.0%). Approximately 40% of mothers were homemakers or unemployed, and among those who worked, many were administrative staff (23.4%), or working as professionals or at the management level (16.0%).

Boys had significantly higher mean weight and height than girls, while the mean triceps and subscapular thicknesses of girls were significantly higher than those of boys (Table 2). The children in this study appear to be bigger than those in Norimah & Lau's (2000) study that reported lower mean weight and height for their subjects in Subang Jaya. This could be due to the fact that their study included children aged 4 – 6 years, whereas ours were aged 5 and 6 years only.

Prevalence of malnutrition

Overall, the problem of overweight and obesity was more prevalent than that of undernutrition among this population of preschoolers in the Klang Valley. The prevalence of undernutrition was higher amongst boys than girls, with the prevalence of thinness significantly so [boys 7.9% (95% CI: 5.5-10.3) vs girls 3.7% (95% CI:2.1-5.3)].

Table 1. Socio-demographic background of mothers of children aged 5 to 6 years

	Malays *n (%)*	*Chinese* *n (%)*	*Indians* *n (%)*	*Others* *n (%)*	*All* *n (%)*
Household size					
1-3	15 (8.5)	12 (6.9)	6 (16.2)	0 (0.0)	33 (8.4)
4-6	137 (77.8)	155 (88.6)	29 (78.4)	5 (83.3)	324 (82.7)
7-12	24 (13.6)	8 (4.6)	2 (5.4)	1 (16.7)	35 (8.9)
Monthly household income					
< RM2500	76 (43.2)	43 (24.6)	18 (48.6)	3 (50.0)	140 (35.5)
RM2500-RM5000	57 (32.4)	68 (38.9)	11 (29.7)	2 (33.3)	138 (35.0)
> RM5000	30 (17.0)	34 (19.4)	5 (13.5)	0 (0.0)	69 (17.5)
Non-response	13 (7.4)	30 (17.1)	3 (8.1)	1 (16.7)	47 (11.9)
Educational level					
No formal schooling	1 (0.6)	0 (0.0)	0 (0.0)	1 (16.7)	2 (0.5)
Primary	1 (0.6)	15 (8.6)	2 (5.4)	0 (0.0)	18 (4.6)
Secondary	113 (64.2)	114 (65.1)	23 (62.2)	2 (33.3)	252 (64.0)
Tertiary	61 (34.7)	46 (26.3)	12 (32.4)	3 (50.0)	122 (31.0)
Employment					
Professional/Management	25 (14.2)	27 (15.4)	11 (29.7)	0 (0.0)	63 (16.0)
Teacher	14 (8.0)	12 (6.9)	2 (5.4)	0 (0.0)	28 (7.1)
Factory worker	11 (6.3)	13 (7.4)	3 (8.1)	1 (16.7)	28 (7.1)
Administrative staff	46 (26.1)	39 (22.3)	5 (13.5)	2 (33.3)	92 (23.4)
Self-employed	12 (6.8)	11 (6.3)	2 (5.4)	0 (0.0)	25 (6.3)
Homemaker/Unemployed	68 (38.6)	73 (41.7)	14 (37.8)	3 (50.0)	158 (40.1)

Table 2. Physical characteristics of subjects (mean ± S.D)

Physical characteristics	*Boys (n=484)*	*Girls (n=508)*
Weight (kg)	20.6 ± 5.0*	19.9 ± 4.4
Height (cm)	114.2 ± 4.3*	113.4 ± 5.3
BMI (kg / m²)	15.7 ± 2.7	15.4 ± 2.4
MUAC (cm)	17.8 ± 2.7	17.7 ± 2.4
Triceps skinfold thickness (mm)	9.5 ± 4.5	10.4 ± 4.3*
Subscapular skinfold thickness (mm)	7.3 ± 4.0	8.2 ± 4.0*

* $p<0.05$, significant difference between sexes (Mann-Whitney test)

Also, the prevalence of obesity was significantly higher amongst boys at 12.2% (95% CI:9.3-15.1) compared to girls at 6.6% (95% CI:4.5-8.8). Mohd Nasir *et al.* (2012), on the other hand, reported a higher prevalence of thinness among preschool girls (4.0%) as compared to boys (2.9%). However, they also found a slightly larger percentage of obesity among boys (8.5%) as compared to girls (7.7%).

Comparison between age groups showed no significant differences between the prevalence of malnutrition between the 5-year olds and their 6-year-old counterparts. When comparing between ethnic groups, Indian preschoolers had the highest prevalence of all the indicators for malnutrition except stunting, while Chinese preschoolers had the lowest prevalence for all the indicators of malnutrition except overweight. However, the comparisons among the ethnic groups were not significantly different, except for the prevalence of obesity among Chinese preschoolers, which was lowest at 5.8% (95%CI:3.6-7.9) compared to that of Malays 11.5% (95%CI:8.4-14.5) and Indians 14.8% (8.4-21.1) (Table 3).

Norimah & Lau's (2000) study in Subang Jaya, an upper middle class suburb, involved only Chinese preschoolers and recorded very low percentages for both the prevalence of undernutrition (underweight and stunting at 2.2% each) and overweight (3.3%). On the other hand, a study conducted amongst preschoolers from lower income households living in Kuala Lumpur reported a higher prevalence of undernutrition (underweight and stunting at 9.7% each) compared to overweight at 4.8% (Wong, 2007). Ng (2004) in a study among preschoolers from low to middle income families in the Klang Valley reported a high prevalence of stunting at 13.4%. In comparison, the present study found that overnutrition was more prevalent than undernutrition. This finding is consistent with the findings of Pang (2003), which also reported a higher percentage of overweight (9.3%) compared to underweight (6.9%) and stunting (4.2%). In a more recent study among preschoolers aged 4-6 years in Peninsular Malaysia, Mohd Nasir *et al.* (2012) also reported concern for a higher prevalence of overweight (7.9%) and obesity (8.1%) than for thinness (3.9%) and stunting (8.4%).

It should be noted, however, that the findings of these studies may not be directly comparable as different growth references

Table 3. Prevalence of malnutrition classifications by sex, age and ethnicity (%, 95%CI)

	n	*Stunting*[1]	*Thinness*[2]	*Overweight*[2]	*Obese*[2]
Sex					
Boys	484	4.7 (2.8-6.5)	7.9 (5.5-10.3)	8.7 (6.2-11.2)	12.2 (9.3-15.1)
Girls	508	3.1 (1.6-4.6)	3.7 (2.1-5.3)	9.6 (7.0-12.1)	6.6 (4.5-8.8)
Age (years)					
5.00-5.99	529	4.1 (2.4-5.8)	5.9 (3.9-8.0)	8.2 (5.9-10.5)	8.6 (6.2-10.9)
6.00-6.99	463	3.6 (1.9-5.3)	5.6 (3.5-7.6)	10.3 (7.5-13.0)	10.3 (7.5-13.0)
Ethnicity					
Malay	419	6.9 (4.5-9.4)	5.7 (3.5-8.0)	7.4 (4.9-9.9)	11.5 (8.4-14.5)
Chinese	451	1.6 (0.4-2.7)	3.8 (0.2-5.5)	10.6 (7.8-13.5)	5.8 (3.6-7.9)
Indian	122	0.8 (-0.8-2.4)	12.3 (6.4-18.2)	10.7 (5.1-16.2)	14.8 (8.4-21.1)
All	992	3.9 (2.7-5.1)	5.8 (4.3-7.2)	9.1 (7.4-10.9)	9.3 (7.5-11.1)

[1] WHO (2007) Height-for-age growth reference
[2] WHO (2007) BMI-for-age growth reference

were used to classify malnutrition. The WHO (1995) reference used in previous studies to classify underweight and overweight was based on a weight-for-age reference, while the WHO (2007) growth reference, used in the present study to classify thinness, overweight and obese, was based on a BMI-for-age reference.

Nutrition knowledge

The mean percentage scores of nutrition knowledge among preschoolers and mothers were at the moderate level (Table 4). The mean percentage score of the Chinese children was significantly higher than that of the Malay and Indian children. A comparison among mothers shows that Malays had the highest mean percentage scores for nutrition knowledge, followed by Chinese and Indians, with a significant difference found between Malays and Indians. There was no significant correlation (r=0.024, p=0.651) between preschooler's nutrition knowledge and the nutrition knowledge of their mothers.

Food intake patterns among preschoolers

The majority of preschoolers (>85%) consumed the three main meals (breakfast, lunch and dinner) daily (Table 5), which agrees with the findings of Norimah & Lau (2000). In addition, this finding is also consistent with other studies that reported only 10% of children skipped their breakfast

Table 4. Mean percentage scores of nutrition knowledge of preschoolers and mothers (mean ± SD)

	Nutrition knowledge of preschoolers	*Nutrition knowledge of mothers*
Ethnicity		
Malay	71.1 ± 9.6 [a]	62.8 ± 15.9[a]
Chinese	75.9 ± 9.2 [b]	58.2 ± 21.4 [a,b]
Indian	70.0 ± 10.0 [a]	56.8 ± 18.6 [b]
All	73.2 ± 9.8	60.2 ± 18.8

[a,b] significant difference among ethnicities based on Kruskal-Wallis test ($p<0.05$) followed by Mann-Whitney test ($p<0.017$)

Table 5. Frequency of meal consumption and food intake of preschoolers

	Everyday	*4-6 times a week*	*2-3 times a week*	*One time a week/sometime*
Meal consumption (n=391)				
Breakfast	338 (86.4)	24 (6.1)	14 (3.6)	15 (3.8)
Lunch	368 (94.1)	18 (4.6)	4 (1.0)	1 (0.3)
Tea time	280 (71.6)	31 (7.9)	28 (7.2)	52 (13.3)
Dinner	365 (93.4)	13 (3.3)	5 (1.3)	8 (2.0)
Supper	146 (37.3)	15 (3.8)	15 (3.8)	215 (55.0)
Food intake (n=384)				
Milk	283 (73.7)	34 (8.9)	26 (6.8)	41 (10.7)
Vegetable	180 (46.9)	69 (18.0)	51 (13.3)	84 (21.9)
Fruit	156 (40.6)	97 (25.3)	83 (21.6)	48 (12.5)
Fast food	25 (6.5)	36 (9.4)	73 (19.0)	250 (65.1)
Snack	76 (19.8)	54 (14.1)	67 (17.4)	187 (48.7)

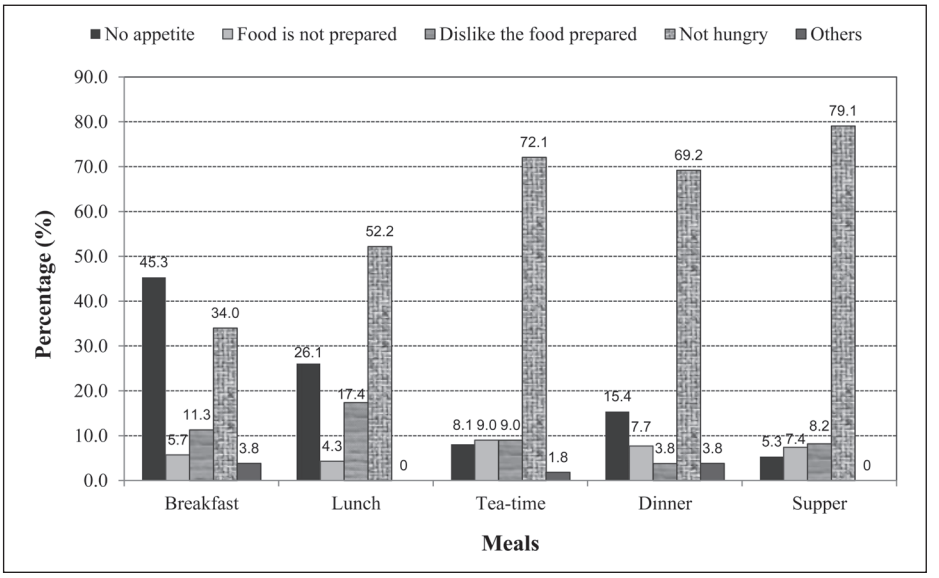

Figure 1. Reasons cited by preschoolers for skipping meals

(ADA, 2008) and 2% of children did not eat lunch (Nicklas *et al.*, 2004). It is important to note that skipping breakfast and lunch may affect the children's nutritional status and academic performance (Hoyland, Dye & Lawton, 2009). In fact, children who skipped their breakfast were found to have lower concentration and poorer performance in mathematics. Mohd Nasir *et al.* (2012) also reported that preschool children who consumed dinner regularly had better cognitive function. Tea-time snacks were consumed daily by almost three quarters of preschoolers (71.5%) but only slightly more than a third of the preschoolers (37.4%) had their supper daily. The foods usually consumed at breakfast were breads, milk, and '*nasi lemak*', while biscuits, breads, 'kuih', and milk were the popular food choices for tea-time and supper.

The main reason provided to explain why preschoolers were not eating particular meals was that they were not hungry during the mealtimes (Figure 1). The second most commonly cited reason was that they had no appetite. Almost half of the preschoolers (45.3%) skipped their breakfast because they had no appetite. This finding is in line with the finding of Lew (2006) from a study conducted on preschoolers in Kajang and Bangi, Selangor. The mother was the main individual who decided the type and amount of food intake for their children for all main meals. Mothers cited themselves as the main decision maker for lunch and dinner (45-60%) less than for breakfast, dinner and supper (65-80%). In fact, it has been reported that preschoolers are dependent on the parents to provide the food during mealtimes (ADA, 2008). Thus, parents play a central role in providing healthy food choices to their young children.

The majority of preschoolers (66.4%) eat outside the home less than once a week, rarely or never; which is similar to the findings of Shamsul *et al.* (2008). We also found that approximately 26.5% of the subjects ate meals outside the home 2-3 times a week, 5.3% ate meals outside the home 4-6 times a week and a very small percentage

(1.9%) ate outside the home daily. According to Shamsul *et al.* (2008), 21.1% had away-from-home breakfast (2-3 times a week), 22.2% for lunch (everyday), and 12.0% for dinner (2-3 times a week), with amounts totalling approximately 31.6% of the monthly food budget.

The majority of the preschoolers liked to eat fruits (95.1%), snacks (93.8%), fast foods (93.3%) and milk (90.8%). However, only 65.1% of preschoolers liked to eat vegetables. Norimah & Lau (2000) also showed that most preschoolers do not like vegetables (60%); similar to the results presented here, most of them liked milk (73%) and fruits (71%). When analysed in greater detail, we found that the preschoolers' favourite fruits were apples, oranges and watermelon, and their favourite vegetables were spinach, cabbage and carrots. Favorite snacks reported were biscuits, ice cream and cake, while pizza, burgers and fries were their favourite fast foods. According to the subjects, carbonated drinks, ice cream and sweets were the foods they liked most but were restricted by their mothers and therefore not consumed very often. This finding is concurrent with the results reported by Pang *et al.* (2003) that foods high in sugar were most well liked by preschoolers but could not be consumed regularly. Based on the preschooler's own perception, our subjects reported that rice, vegetables and chicken were the foods that they did not like but had to eat often. Pang *et al.* (2003) also reported similar findings. A more recent study among preschool children in Kuala Lumpur raised concerns on the frequency of sugary foods and drinks consumption and its unfavourable outcome on dental health (Zahara, Fashihah & Nurul 2010).

The majority of preschoolers (73.7%) drank milk daily, which is consistent with the findings of Lew (2006) (Table 5). This is advantageous as milk intake has been shown to be positively correlated with the calcium intake of children (Frary, Johnson & Wang, 2004). Alaimo, Olson & Frongillo (2001) and Fu *et al.* (2007) found that children who were deficient in dairy product consumption may experience negative effects on their academic performance and concentration. We also found that the frequencies of our subjects taking vegetables and fruits daily were lower than 50%, which implies that less than half the preschoolers were meeting the recommendations for fruits and vegetables. Similarly, Guenther *et al.* (2006) reported that approximately 80-90% of children aged 4-13 years old failed to meet the serving recommendations for both vegetables and fruits. A study in Taiwan showed that consumption of highly nutrient-dense foods, including vegetables and fruits, was beneficial to the academic performance of children where children in the lowest tertile of high nutrient-dense food consumption had 1.9 times the odds of having unfavourable overall school performance (Fu *et al*., 2007). Furthermore, a large proportion of the subjects in this study consumed fast foods (34.9%) and snacks (51.3%) at least 2-3 times a week. The same study by Fu *et al.* (2007) found that a high intake of high fat snacks, sweets and fried foods has a negative impact on academic performance among children.

Spearman's correlation shows that the household income (r=-0.164, p<0.01) and level of maternal education (r=-0.109, p<0.05) had a weak but significant negative correlation with the frequency of eating away from home. Highly educated mothers usually possess good nutrition knowledge and may help their children establish healthy eating habits (Fu *et al.*, 2007). However, the finding of Simmons *et al*. (2005) showed no significant correlation between the frequency of eating away from home and household income or level of education.

The preschoolers' nutrition knowledge was positively correlated with their milk intake (r=0.133, p<0.01), while the mothers' nutrition knowledge was positively correlated with vegetable intake (r=0.111, p<0.05) and negatively correlated with snack

intake of the preschoolers (r=-0.134, p<0.05). Children from families with highly educated parents usually have healthy eating patterns (Fu *et al*., 2007) because their parents typically will make healthy food choices for them (Clark *et al*., 2007). Additionally, maternal education level has been shown to be positively correlated with the intake of fruits and vegetables (Vereecken *et al.*, 2004) and negatively correlated with intake of added sugar among preschoolers (Kranz & Siega-Riz 2002).

The limitation of this study is that only a subsample of mothers and preschoolers participated in the dietary habits and nutrition knowledge questionnaire study. In addition, due to the lengthy, time-consuming questionnaire, those who answered the questionnaire were volunteers and not randomly selected from the main subject pool. The strength of this study is that it covered a total of 72 kindergartens from all areas of Kuala Lumpur and Petaling Jaya. We would like to suggest that further studies be conducted among larger sample sizes of preschoolers and their mothers from different areas of the country. Studies on the dietary intake and pattern of preschoolers can also include the influence of kindergarten and caregivers who also provide foods to the children for a large part of the day.

CONCLUSION

Evidence of a higher prevalence of overweight / obesity than thinness / stunting was found in the urban children aged 5-6 years in this study. Both mothers and the children showed a moderate level of nutrition knowledge. Dietary intake patterns showed that the majority of the children ate their main meals daily whilst two-thirds ate out once a week or less. In terms of food preferences, more than 90% of the preschoolers liked fruits, milk, fast foods and snacks, while only 65% of the preschoolers reported liking vegetables. The preschoolers' eating habits were influenced by household income, maternal educational level and maternal nutrition knowledge. Nutrition intervention for children attending kindergartens and their mothers should take into consideration these socio-economic factors.

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