RESEARCH ARTICLE

Nutritional status and feeding practices among toddlers in selected nurseries in Puncak Alam, Selangor, Malaysia

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Abstract:

Nutrition intake and growth during the first five years of life is vital to ensure optimum growth and cognitive development of a child. The National Health and Morbidity Survey in this country indicated that stunting was highest among children 24 to 35 months while overweight was highest among 36 to 47 months, indicating the importance of nutrition assessment in these groups of children. Hence, this study was designed to assess the current growth and nutrition intake and history of feeding practices of the participants. Sixty-seven participants from nine selected nurseries were included in this cross-sectional study. The anthropometry measurements were taken and compared with the WHO growth charts. A three days food diary was used to assess the nutrition intake of the participants. The study revealed that the participants consumed more than twice than the national protein recommendation (boys: 30.7 ± 4.4, and girls 29.7± 5.0) and low calcium intake (boys: 369.7±108.5, girls: 444±51.9). The results also showed a poor history of feeding practices, in which only 25% of the participants were exclusively breastfed until six months and early initiation of solids and semi-solids, as around 25% of the participants were introduced to solids or semi-solids before six months. The results strongly suggest that more initiative needs to be taken to educate mothers on infant and young child feeding practices as nutritional intake and growth during this period are associated with many medical conditions in the future.

Keywords: Early feeding practices, nutritional status, nurseries toddlers

1. INTRODUCTION

Nutritional status is important in assessing the state of nourishment in a child. Growth and dietary intake of toddlers are essential as these parameters reflect feeding practices during infancy and current nutrition intake, which are known risk factors to develop obesity or other non-communicable diseases in the future [1,2]. Factors that influence the nutritional intake of children include inadequate food intake, inappropriate feeding practices, perinatal care practices, socio-economic status, undesirable socio-cultural practices, maternal literacy and employment, etc. [3-6].

Traditionally, feeding practices of infants and young children were reported as breastfeeding and complementary feeding practices. However, in recent years complementary feeding has been replaced with the term solid, semi solid or soft food as it is easier to measure food intake using these terms [7]. In this study, feeding practices are reported as breastfeeding and solid and semi solids feeding practices.

Early feeding practices is one of the factors that have a significant influence on growth and cognitive performance among children globally. Studies show that inappropriate feeding practices during the first year of life is the main factor for malnutrition and poor cognitive performance in children under five years old [8,9]. Early feeding practices include breastfeeding practices and solid and semi solid feeding practices during the first two years of life.

Early feeding practices are associated with growth and development of toddlers. Studies show that time of introduction, taste and texture of solids during the first year of life has a strong effect on moulding the eating preferences of a child in later life [4]. Studies indicate that the main factors associated with feeding practices of a child is maternal literacy and employment [5,10].

The report by National Health and Morbidity Survey (NHMS) indicated that there was an increase in the percentage of children grouped under the normal weight category from 2006 to 2015 [11,12]. Those studies too

indicated that the percentage of children grouped under the normal weight category had reduced from 83.7% in 2006 to 80.3% in 2015. The data also reported an increase in the prevalence of both overweight and underweight, suggesting that the country still suffers the issue of dual burden of malnutrition.

The increase in the prevalence of underweight and overweight in children under five in this country calls for intervention much earlier in the life cycle. There is fair amount of studies reported on nutrition intake during the first year of life; however, data on nutritional status during first to the third year of life is scarce. This may be due to the technical effort involved in assessing the nutritional intake of the children during this stage. Referring to the existing studies that link the importance of nutritional intake during early stages of life with growth and nutritional practices in early childhood, hence it is worth to investigate the nutrition status of children aged 1 to 3 years old in this country.

Hence, this study was conducted in selected childcare nurseries in Puncak Alam, Selangor to assess the growth and nutrition intake of the toddlers and evaluate the history of the feeding practices of the toddlers.

The study was conducted in nurseries as it is convenient to approach study participants and their respective mothers within the selected age in these settings. The study will give an idea of the baseline characteristics of anthropometry, current nutrition intake and early feeding practices data of children in the selected age in Puncak Alam, Selangor.

2. MATERIALS AND METHODS

2.1 Study Design and Location

This was a cross-sectional study conducted in nine selected nurseries in Puncak Alam, Selangor. A simple random sampling was used to choose the nine selected nurseries which were located in Puncak Alam Selangor. Participants from all the nine nurseries were recruited according to convenient sampling. Participants whose parents were willing to participate in this study only were enrolled in the study.

2.2 Participants

Children aged one to three years old were recruited in the study based on the inclusion criterias of (1) aged 1 to 3 years old, (2) were born between 37 to 42 gestation weeks and (3) have births weight of more than 2.5kg and less than 4.5kg. The exclusion criterias are (1) the participant was not suffering from any illnesses or diseases that can influence food intake and nutritional status, such as gastrointestinal problems, allergy, inborn error, asthma, diabetes, congenital heart disease, kidney disease, liver failure, etc and (2) participants were not admitted to the hospital anytime during the past six months.

2.3 Sample Size

96 participants were needed after calculating for sample size using Krejcie & Morgan (1979) formula including a 20% dropout.

2.4 Instruments and methods

Table 1. Objectives, study variables and instruments of the study

Objective	Study Variables	Instruments
To assess the anthropometry status of the children	Weight for age Height for age Weight for height Head circumference MUAC	WHO Growth charts Weighing Scale SECA 813 Body Meter SECA 206 Measuring tape
To evaluate the nutritional intake of the children	Total macronutrient and micronutrients intake	Food Diary (3days) RNI Nutritionist Pro

2.5 Data Collection

Data collection was conducted after seeking permission from the respected kindergartens and after obtaining permission from the parents through a consent form. A questionnaire that consists of 4 parts which were demographic details, prenatal characteristics, child characteristics and feeding history was used to collect information needed. The anthropometric measurements such as weight, height, head circumference and mid upper armcircumference of the participants were taken during breaktime by a trained research assistant (RA). All measurements were taken according to the NHANES Anthropometry Procedures Manual [8]. Type of measurements and instruments used is given in Table 1. The RA later helped in filling in the questionnaire by interviewing the parents of the participants. At the end of the interview, the RA educated the parent or caregiver that will be feeding the child on how to fill in the Three Days Food Diary.

Participants' parents or caegivers were expected to fill in all the solids/ semi solid and liquid taken for the whole day on two weekdays and one weekend. The portion and quantity of food were recorded according to the given handouts that consisted a list and picture of household measurements. Parents/ caregivers were given two weeks to complete the given food diary. Returned food diaries were examined by the RA and attached to the questionnaire before data analysis.

2.6 Data Analysis

Anthropometry data was interpreted using WHO Growth Charts. Three days food record was interpreted using diet 4 software. Then the average values were compared to Recommended Nutrient Intake (RNI) of Malaysia. Data was entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 17. Discriptive statistics were presented in tables and graphs.

3. RESULTS AND DISCUSSION

3.1 Demographic information

67 participants from a total of 80 participants completed and returned the questionnaire. All the participants were Muslim and lived with their parents who were both working. The distributions between the gender of the participants were nearly equal in which 50.7% (n=34) of them were boys and

49.3% (n=33) were girls. The distribution of participants according to their age is given in table 3.1. There were 43.4% who were one year old, 31.3% aged two years old and 25.5% aged three years old. All the mothers had a minimum of secondary school education in which 46.3% of them had a SPM/STPM/Diploma education while the remaining 53.7% had a tertiary education, as shown in Table 3.1.

Table 2. Demographic information of the subjects (n=67)

Demographic characteristics	n	Percentage (%)
Gender		
Boy	34	50.7
Girl	33	49.3
Age		
1 years old	29	43.4
2 years old	21	31.3
3 years old	17	25.4
Maternal education level		
Secondary		
SPM/ SLE	14	20.9
STPM/ Diploma/ A – Level/ Sijil	17	25.4
Tertiary		
Degree	33	49.2
Master/ PhD	3	4.5

3.2 Anthropometry characteristics of the participants.

The anthropometry characteristics of the participants according to the WHO Growth Charts are tabulated in table 3.2. None of the participants were severely underweight or overweight; nearly 90% of the participants fell in the category of normal weight. However, 15% of the participants were stunted and 1.5% were severely stunted. Nearly 96% of the participants had normal BMI and MUAC while 97% of them had normal head circumference for age.

The percentage of underweight was higher in boys (14.7%) than girls (6.1%). Same goes to the prevalence of stunting which was higher in boys (17.6%) than girls (12.1%).

Table 4. Proportion of participants according to WHO growth chart.

Infant's characteristics	Boys, n = 35 (%)	Girls, n = 32 (%)	Total, n=67 (%)
Weight-for-age			
Severe Underweight	0	0	0
Underweight	14.7	6.1	10.4
Normal	85.3	93.9	89.6
Overweight	0	0	0
Height-for-age			
Severe stunting	2.9	0	1.5
Stunting	17.6	12.1	14.9
Normal	79.4	87.9	83.6
BMI-for-age			
Severe wasting	0	0	0
Wasting	0	6.1	3
Normal	97.1	93.3	95.5
Overweight	2.9	0	1.5
Obese	0	0	0
MUAC-for-age			
Severe wasting	0	0	0
Wasting	2.9	6.1	4.5
Normal	97.1	93.9	95.5
HC-for-age			
Microcephaly	2.9	3	3
Normal	97.1	97	97
Macrocephaly	0	0	0

3.3 History of breastfeeding

Breastfeeding practices were reported as exclusively breastfed and any kind of breastfeeding which may include exclusive breastfeeding, breastfed with solid intakes or mixed feeding (formula milk and breast milk). This study found that 53.7% of the participants were exclusively breastfed for the first six months. Most participants were provided any kind of breastfeeding for up to 3 months (40.3%). Only 3% of the participants received any kind of breastfeeding after six months.

Table 3. History of breastfeeding

	n	%
Infant feeding practices		
exclusively breastfed for the first six months	36	53.7
Duration of any kind of breastfeeding		
< 1 month	5	7.5
1st month	9	13.4
3rd month	27	40.3
5th month	7	10.4
6th month	17	25.4
> 6months	2	3

3.4 Time of introduction to solid or semi-solid food

The finding indicated that most of the participants (68.7%) were introduced to solid and semi-solid food at the age of 6 months, followed by 19.4% at 3 to 4 months 7.5% below 3 months old and 4.5 % after six months.

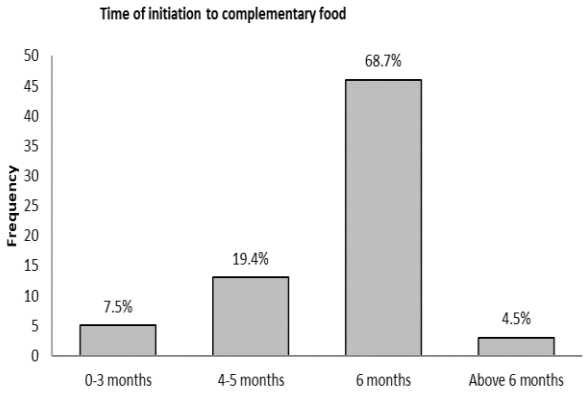

Figure 1: Time of initiation to solid or semi-solid food

3.5 Solid and Semi solids feeding practices

Most mothers practiced appropriate feeding practices during the introduction to solid and semi-solid as shown in figure 3.2. Most of the mothers (68.7%) introduced solid and semi solids to their infants at six months. However, less than 50% of the mothers did not practice providing the same kind of new food for three days consecutively before trying out something new. 62.7% did offer a particular food that was rejected by the child a few times and 73.1% practiced introducing one new food at a time. There were around

37.3% of the mothers who did not practice placing the child in a proper position before feeding.

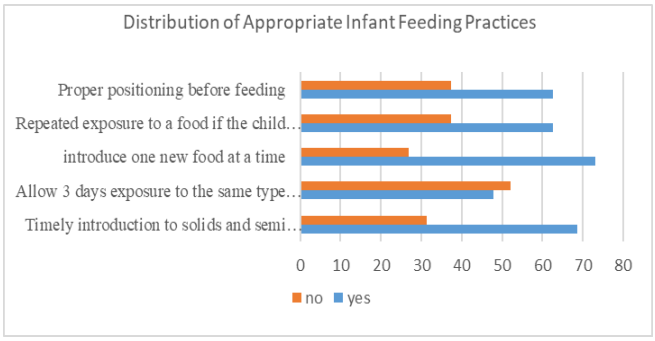

Figure 2. Percentage of mothers that practiced appropriate solid and semi-solid feeding practices

3.6 Comparison between the current nutrient intake of the participants with the Recommended Nutrient Intake (RNI) of Malaysia.

Both male and female participants consumed protein higher than the national recommendations. The mean protein intake of the male participants was 18.7 g higher than the recommendation while the mean protein intake of the girl participants was 17.7g higher than the recommendations. The mean fat intake of the participants was also higher than the recommendation.

However, the calcium intake of both the male and female participants were lower than the recommendation. The mean calcium intake of the male and female participants was 330mg and 256mg lesser than the recommendation. The iron intake of the participants from the gender were around 62% higher than the recommendation. The comparison of the mean of selected nutrient intake of the participants for 3 days with the RNI of Malaysia is shown in Table 3.4.

Table 6. Comparing nutrient intake of subjects with Recommended Nutrient Intake (RNI)

	Boys, n=35			Girls, n=32		
	Intake (Mean±SD)	RNI	(%)	Intake (Mean±SD)	RNI	(%)
Energy (Kcal)	984.89±81.8	980	101	939.1±33.1	900	103
Protein (g)	30.7±4.4	12	181	29.7±5	12	175
Carbohydrate (g)	134.4±25	-	-	125.3±16.1	-	-
Fat (g)	39.8±6.7	27-38	-	36±4.9	25-35	-
Calcium (mg)	369.7±108.5	700	74	444±51.9	700	89
Iron (mg)	9.7±1.2	6	162	9.9±0.5	6	165

3.7 Comparison of selected macronutrients and micronutrients intake of the participants according to commercial and homemade food intake

The distribution of selected macro and micronutrient intake among the participants were grouped according to those who had 100% of homemade food in the selected 3 days and those who had at least one commercial food in the 3 days. Table 3.4 shows that there was a significant difference in the calorie intake of the participants from both the groups.

Table 5. Comparison between the types of complementary food with the nutrient intake of the subjects

Nutrient	Commercial food, n=11	Homemade food, n=56	p-value
	Mean ± SD	Mean ± SD	
Energy	926±62.93	969.48±65.24	0.046*
Carbohydrate	126.21±18.74	130.62±21.96	0.536
Protein	30.56±5.77	30.08±4.48	0.754
Fat	35.65±6.94	38.39±5.92	0.177
Calcium	433.67±99.22	401.04±91.43	0.290
Iron	9.64±0.91	9.81±0.9	0.578

*level of significance at $p<0.05$

3.8 Discussion

Most of the subjects have normal anthropometry measurements. The results of this study showed a higher prevalence of stunting among male children compared to females. These results correspond well with their calcium intake in which the female children seem to consume higher calcium intake compared to the males. Studies in a few third world county also indicated a higher prevalence of stunting in males compared to female's children [1, 2]. However, the higher prevalence of stunting among the males may be a result of poor calcium and protein intake in male infants during the first year of life in third world countries. Studies also have indicated that early weaning of breastfeeding as a source of stunting among the children in third world countries hence it may be worth understanding the differences in breastfeeding practices among the male and female infants in this country to draw a better conclusion [2].

The percentage of exclusively breastfed participants in this study were 53.7% which is higher than a previous study in Klang valley that reported the prevalence of breastfeeding as 43% [3]. The results of any kind of breastfeeding also declined notably from 3 months on words suggesting that mothers begin to quit breastfeeding after resuming work. As reported in Table 1, all the mothers were employed. A qualitative study conducted in Malaysia also reported that lack of awareness on methods of breastmilk expression and storage and even lack of facilities to express and store the breastmilk at work were essential factors to early cessation of breastfeeding [4].

The results from this study show nearly 20% of the participants were introduced to solids or semi solids at 4 to5 months, while around 7.5% of the participants were introduced to solids and semi-solids within the third month of their life. This might be a reason for nearly 15% of the participants to be stunted as studies have shown that early introduction to solids and semi-solids will compromise on the milk intake of the infants hence result in a reduced height for age [2].

Education on early feeding practices needs to be enforced among mothers as the results indicated that around 30 to 40% of the mothers were not practicing appropriate solid or semi solid feeding practices. It is important to establish good feeding practices as it molds lifelong eating habits [8]. Education can be carried out both at mother and child clinics or home visits as evidence suggest that early intervention through these platform has helped to reduce the intake of formula milk and increase duration of breastfeeding, reduce

the intake of sugar sweetened beverages and improved child's BMI [9].

The results of this study also showed that the participants consumed more than twice higher protein intake than the recommendations. Studies show that high protein intake will result in accelerated growth and will increase the risk of being overweight or obese later in childhood [5, 6]. However there are convincing studies that suggest the type of protein rather than the amount itself is associated with the risk of developing obesity in the future [5-7].

The study also reported that those who consumed at least one commercial food during the three days logged in their food diary, indicated a higher mean energy intake compared to those who consumed food for all three days from home or from the nursery. This is a good indicator to show that commercial food may contain higher energy intake compared to home-cooked food as studies have reported a high level of sugar, salt and fat in commercially prepared food [10]. Hence a high intake of this commercially available food may result in future obesity.

4. CONCLUSIONS

The findings from this study are in line with the national statistics of this country that indicated a rapid increment in childhood obesity and stunting in this country in recent years [11-13]. However, more cross-sectional data on growth and nutritional intake in participants of the same group should be gathered to draw a conclusive hypothesis that may be used to implement early intervention on feeding practices in children. Given the broad literature on the effect of type of protein consumed in children during early life may have a stronger impact on the future development of obesity; hence a more comprehensive dietary assessment should be done mainly on the types of protein intake during infancy and the association with overweight and obesity in early childhood and adulthood. In addition, it is worth to follow up a cohort from birth to the first 5 years to study the effect of early nutritional intake on growth and eating practices throughout childhood.

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