ORIGINAL ARTICLE

Food Security and Child Nutritional Status Among Orang Asli (Temuan) Households in Hulu Langat, Selangor

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Summary

This study was conducted to determine the prevalence of household food insecurity and its potential risk factors and outcomes among the Orang Asli (Temuan) households. Socioeconomic, demographic and food security information of the households and anthropometric measurements and dietary intakes of preschoolers (n=64) were obtained using a structured questionnaire. Food security was assessed using the Radimer/Cornell hunger and food insecurity instrument. Diet quality was based on 24 hour recall and analyzed according to the Malaysian RDA and Food Guide Pyramid. Majority of the households (82%) reported some kind of household food insecurity. The prevalence of significant underweight, stunting and wasting were 45.3%, 51.6% and 7.8%, respectively. Dietary intakes were less than 2/3 RDA levels for calories, calcium and iron. However, the intakes of protein, vitamin A, vitamin C and niacin exceeded the RDA and the sources for these nutrients were mainly rice, fish and green leafy vegetables. Among the five food groups, only the number of servings from cereals/cereal products/tubers group was achieved while that of the milk/diary products was the worst. Majority of the children (68.7%) had poor, 31.3% had fair and none with excellent diet quality. In general, diet quality and nutritional status of the children decreased as household food insecurity worsened. It is recommended that the nutritional problems of Orang Asli children be addressed through health, nutrition and economic programs and further studies should be carried out on determinants and consequences of household food insecurity.

Key Words: Food security, Nutritional status, Diet quality, Temuan households

Introduction

Food security is defined as "access by all people, at all times to sufficient food for an active and healthy life. It includes at a minimum the ready availability of nutritionally adequate and safe foods and an assured ability to acquire acceptable foods in a socially acceptable ways"[1]. The least severe condition of food insecurity may include anxiety of not having enough food for consumption or running out of food and having no money to purchase more food. For adults who are experiencing food insecurity, they may skip meals, cut the portion size of meals or go without food for one or more days in their attempts to avoid hunger. However, when food is scarce, these mechanisms to avoid hunger may be

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ineffective and consequently severe personal hunger and hunger among other family members and children may occur[2].

There are many factors that contribute to household food insecurity. In many studies, low socioeconomic status has consistently been shown to be a risk factor[3,4,5]. For example, limited income combined with the increasing living expenses (housing, electricity, medical etc.), certain disabilities or poor health can result in an increased risk of food insecurity[6]. Household food insecurity may be a common phenomenon among the low-income households as the household's financial situation is a primary factor in determining when food is available and the types of food consumed. In general, as household income increases, food insecurity decreases[7].

Food insecurity may lead to inadequate dietary intakes and nutrient deficiencies[8]. These consequently can contribute to inappropriate growth attainment such as stunting, underweight and wasting or other nutritional deficiencies (e.g. vitamin A, iron, iodine) especially among young children as they are very susceptible to unsatisfactory food intakes. According to UNICEF, the deaths of over 6 million (55%) children under five are either directly or indirectly attributable to malnutrition and many children suffer multiple types of malnutrition[9].

In Malaysia the incidence of poverty in 1997 was 6.1% with 294,4000 poor households[10]. The various five-year Malaysian development plans have identified the Orang Asli, the indigenous people of Peninsular Malaysia, as one of the poorest groups in the country[11]. In addition, studies among the Orang Asli have shown that their nutritional status is poorer than the other ethnic groups in Malaysia[12,13,14]. This study was undertaken to determine the prevalence of food insecurity and undernutrition among the Orang Asli (Temuan) children (3 - 6 years of age) and the possible associations between food insecurity and nutritional status (dietary intakes and anthropometric measurements). The results of the study also provided some aspects of validation for the 'Radimer/Cornell hunger and food insecurity' instrument and the 'Diet Quality Index' that have been adopted from the United States.

Materials and Methods

The study was carried out from October - November 2000 in two Orang Asli villages (Sungai Chemong and Kuala Pansoon) where both are located in the district of Hulu Langat Selangor. Both communities were of the same sub-ethnic group - the Temuan of the Proto-Malays. There were a total of 82 households (46 in Kuala Pansoon and 36 in Sungai Chemong) in these villages and both villages were under the "Program Pembasmian Rakyat Termiskin (PPRT)". Households from both villages having at least one child aged 3 - 6 years old were invited to participate in the study. However, only 64 households (34 in Kuala Pansoon and 30 in Sungai Chemong) met this criterion and in households where there was more than one child in this age group, one child was randomly selected for this study.

Permission to conduct this study was obtained from Jabatan Hal-Ehwal Orang Asli (JHEOA) prior to data collection. The mothers were the respondents and interviews were carried out from house to house using an administered questionnaire. The questionnaire consisted of four parts - household demography and socioeconomy, Radimer/Cornell hunger and food insecurity, dietary intake (24-hour recall) and anthropometry measurements.

The Radimer/Cornell hunger and food instrument[15] consists of 10 items that classify the households as 'food secure', 'household food insecure', 'individual food insecure' and 'child hunger'. The individual food insecurity refers to the mother's inadequate food intake while child hunger (the most severe form of food insecurity) occurs only after the adults and mothers in the households have been affected by household

food shortages. The instrument rationalizes that in a food insecure household, children will be the last ones to go hungry.

The weight and height measurements of children were taken using Tanita digital weighing scale and microtoise tape, respectively. The measurements were recorded to the nearest 0.1kg for weight and 0.1cm for height. The birth dates of the children were obtained from birth certificates and their ages were calculated in months as the difference between the date of births and date of measurements. The weight, height and age were translated into three indices: weight-for-age, height-for-age and weight-for-height. These indices were expressed in terms of z scores of the National Center for Health Statistics (NCHS) growth reference[16]:

Significantly underweight/stunted/wasted -
< -2 SD of NCHS reference

Mildly underweight/stunted/wasted -
-2 SD ≤ x < -1 SD of NCHS reference

Normal -
-1 SD ≤ x ≤ 2 SD of NCHS reference

High -
> 2 SD of NCHS reference

The dietary intakes of children were assessed using 24 hour recall (2 days). The mothers were asked to recall the foods consumed by their children with the estimation of portion sizes using household measurements (spoon, cups, bowls, saucer etc.). The dietary intake data were transformed into two measurements for analyses:

a) Energy (kcal) and nutrient intakes (protein, carbohydrate, fat, vitamin A and C, niacin, thiamine, riboflavin, calcium and iron) were evaluated for adequacy using the RDA of Malaysia as mean percentage of the RDA. Intake of energy or nutrient below 2/3 of RDA (67%) was considered to be inadequate.

b) The number of servings of foods from the five food groups (Table I) was evaluated using Diet Quality Index that has been adapted from Patterson *et al.*[17]. The recommended serving size used is based on the Malaysian Food Guide Pyramid for children. A person consuming the minimum recommended servings from the food group is given 2 while a person consuming none from the food group gets 0. The points for the five food groups were then summed to obtain the diet quality index:

0 - 4	:	poor diet quality
5 - 9	:	fair diet quality
10	:	excellent

All statistical data were analyzed descriptively using the Statistical Package for Social Science 10.05 (SPSS 10.05). ANTHRO software was used to analyze the anthropometric data while the analysis on dietary intakes of the children were done using DIET 4 software and the manual of 'Nutrient Composition of Malaysian Foods'[18].

Results

A total of 42 boys (65.6%) and 22 girls (34.4%) were included in the study (Table II). The average household size was 6.73 which was higher than the national average household size of 4.8 reported in the Malaysian census in 1991[19]. Mothers were found to have lower educational attainment and average years of schooling compared to the fathers. However, more than 50% of both mothers (54.7%) and fathers (62.5%) had at least primary education.

The mean monthly household income of this sample was RM595.92 which was much lower than the mean monthly income for households in Malaysia (RM2607)[10]. However, the mean household income in this study was much higher than that reported by Osman *et al.*[20] among the Temuan households in Kampung Orang Asli Pansoon (RM233). Using RM460 for a household size of 4.6 and RM230 to categorize those living

Table I
Diet Quality Index Based on Food Groups

Food Group	Recommended Serving	Score	Criteria for Scoring
Cereals, cereal products and tubers	6 - 10	2	6 - 10 servings
		1	4 - 5 servings
		0	0 - 3 servings
Vegetables	2	2	2 servings
		1	1 serving
		0	0 serving
Fruits	2	2	2 servings
		1	1 serving
		0	0 serving
Milk and dairy products	2	2	2 servings
		1	1 serving
		0	0 serving
Fish, poultry, meat and legumes	2 - 3	2	2 - 3 servings
		1	1 serving
		0	0 serving

Score *2 - Individuals who met a dietary goal*
1 - Individuals who did not meet dietary goal but had a fair diet
0 - Individuals with poor diet

below the poverty line and as hard core poor, respectively, approximately 54.7% and 12.5% of the households fell into these two categories. The average income per capita among these households (RM99) was similar to that of the national poverty line income per capita (RM100). The average, however, was much lower than the per capita monthly income of households in rural villages and estates in Peninsular Malaysia (RM120)[21]. Households with income per capita below the poverty line was 67.2% with 26.6% having less than RM50 (or hard core poor).

Table III indicates the prevalence of household food insecurity among the study sample. Majority of the households (82.8%) reported some kind of household food insecurity. It was observed that households with child hunger also experienced household food insecure and individual food insecure. Similarly, households with individual food insecurity also experienced household food insecurity. As income is an important determinant of food security, our study shows that in general, as household income and income per capita increased, household food security improved (Table IV).

The prevalence of underweight, stunting and wasting among the Orang Asli children are shown in Table V. More than 80% of the children were underweight and stunted with approximately 45% and 52% of them were significantly underweight and stunted. These findings are also supported by the mean z scores for weight-for-age (-1.90 SD) and height-for-age (-2.18 SD) of the children.

Calorie and nutrient intakes expressed as mean percentages of the RDA are presented in Table VI. The mean calorie, calcium and iron intakes were less than 2/3 of RDA with 66%, 63% and 59% (Table VII) of the children falling into this category. Although the mean intakes of thiamine and riboflavin seemed adequate, 40 - 45% of the

Table II
Child and Household Demographic and Economic Characteristics (n = 64)

	n	%	Mean ± SD	Median
Child Gender				
Male	42	65.60		
Female	22	34.40		
Education Level				
Father				
No schooling	16	25.0		
Primary school	40	62.5		
Lower secondary	7	10.9		
Upper secondary	1	1.6		
Mother				
No schooling	26	40.6		
Primary school	35	54.7		
Lower secondary	2	3.1		
Upper secondary	1	1.6		
Years of education				
Father	64	100.0	3.97 ± 3.08	5.00
Mother	64	100.0	2.77 ± 2.80	3.00
Household size	64	100.0	6.73 ± 2.26	7.00
Household income (RM)			595.92 ± 375.18	500.00
< RM 250	8	12.5		
RM 250 - RM 500	27	42.2		
> RM 500	29	45.3		
Income of father (RM)	63	98.4	449.83 ± 310.39	400.00
Income of mother (RM)	21	32.8	304.76 ± 168.75	300.00
Household income per capita (RM)			99.07 ± 76.48	77.50
< RM 50	17	26.6		
RM 50 - RM 100	26	40.6		
> RM 100	21	32.8		
Job status				
Father				
Private sector	17	26.6		
Self-employed	46	71.9		
Unemployed	1	1.6		
Mother				
Private sector	11	17.2		
Self-employed	10	15.6		
Homemaker	43	67.2		

Table III
Prevalence of Household Food Insecurity (n=64)

Category	n	%
Food Secure	12	18.8
Household Insecure	13	20.3
Individual Insecure	21	32.8
Child Hunger	18	28.1

children had intakes less than 2/3 of the RDA for these B vitamins. Similarly, although the percentage contributions from carbohydrate, protein and fat to the total calories were in accordance to recommendation (carbohydrate: 55 - 60%; protein: 10 - 15%, fat: 15 - 30%), the intake of total calories was only 63.14% which was less than 2/3 of the RDA level (Table VIII).

The mean number of servings for food groups and the distribution of diet quality among the children are presented in Table IX and Table X.

Table IV
Prevalence of Household Food Insecurity according to Household Income and Income per Capita (n=64)

Category	n (%)	n (%)
Household Income	≤ RM 500	> RM 500
Food Secure	6 (17.1)	6 (20.7)
Household Insecure	6 (17.1)	7 (24.1)
Individual Insecure	13 (37.2)	8 (27.6)
Child Hunger	10 (28.6)	8 (27.6)
Income per Capita	≤ RM 100	> RM 100
Food Secure	7 (16.3)	5 (23.8)
Household Insecure	8 (18.6)	5 (23.8)
Individual Insecure	15 (34.9)	6 (28.6)
Child Hunger	13 (30.2)	5 (23.8)

Among the five food groups, only the cereals, cereal products and tubers group met the dietary goal of 6 - 10 servings. These findings were further supported by the percentages of children who have poor (68.7%) and fair (31.3%) diet quality but none with an excellent diet quality. In

Table V
Prevalence and Mean z Scores for Nutritional Status Indicators (n = 64)

	Male n (%)	Female n (%)	Total n (%)	Total Mean ± SD	Total Median
Weight for age				-1.90 ± 0.84	-1.93
Significant[1] underweight	19 (45.2)	10 (45.5)	29 (45.3)		
Mildly[2] underweight	17 (40.5)	10 (45.5)	27 (42.2)		
Normal[3]	6 (14.3)	2 (9.1)	8 (12.5)		
Height for age				-2.18 ± 1.11	-2.03
Significant[1] stunted	21 (50.0)	12 (54.5)	33 (51.6)		
Mildly[2] stunted	16 (38.1)	7 (31.8)	23 (35.9)		
Normal[3]	5 (11.9)	3 (13.6)	8 (12.5)		
Weight for height				-0.80 ± 1.05	-0.72
Significant[1] wasted	2 (4.8)	3 (13.6)	5 (7.8)		
Mildly[2] wasted	13 (31.0)	8 (36.4)	21 (32.8)		
Normal[3]	26 (61.9)	11 (50.0)	37 (57.8)		
High[4]	1 (2.3)	-	1 (1.6)		

Significant[1] underweight/stunted/wasted = < -2 SD of NCHS reference median
Mildly[2] underweight/stunted/wasted = -2 SD ≤ x < -1 SD of NCHS reference median
Normal[3] = -1 SD ≤ x ≤ 2 SD of NCHS reference median
High[4] = > 2 SD of NCHS reference median

Table VI
Calorie and Nutrient Intake and the Intake Eexpressed as Mean Percentage of RDA Requirement according to Gender (n = 64)

	Male Mean ± SD	Female Mean ± SD	Total Mean ± SD	Total Median
Calorie (Kcal)	1058.64 ± 441.83	1072.95 ± 398.89	1063.56 ± 424.42	1049.48
(%RDA)	(63.75 ± 27.78)	(61.96 ± 23.95)	(63.14 ± 26.34)	(59.70)
Protein (g)	40.26 ± 23.45	38.87 ± 16.37	39.78 ± 21.16	37.00
(%RDA)	(148.73 ± 85.89)	(139.83 ± 60.30)	(145.67 ± 77.66)	(141.61)
Vitamin A (µg RE)	355.06 ± 216.28	409.00 ± 204.86	373.60 ± 212.37	327.00
(%RDA)	(125.38 ± 78.49)	(140.96 ± 68.94)	(130.74 ± 75.16)	(110.60)
Thiamine (mg)	0.57 ± 0.36	0.63 ± 0.31	0.59 ± 0.34	0.59
(%RDA)	(92.53 ± 63.11)	(96.34 ± 47.95)	(93.84 ± 57.98)	(86.43)
Riboflavin (mg)	0.77 ± 0.42	0.85 ± 0.42	0.80 ± 0.42	0.73
(%RDA)	(78.47 ± 46.93)	(82.84 ± 45.46)	(79.97 ± 46.11)	(71.99)
Niacin (mg NE)	13.21 ± 7.79	12.15 ± 5.90	12.84 ± 7.16	11.92
(%RDA)	(120.23 ± 72.52)	(106.74 ± 56.57)	(115.59 ± 67.32)	(103.72)
Vitamin C (mg)	41.12 ± 36.52	59.81 ± 40.14	47.55 ± 38.54	39.50
(%RDA)	(205.61±182.61)	(299.05±200.71)	(237.73±192.70)	(197.50)
Calcium (mg)	274.65 ± 158.28	282.39 ± 114.51	277.31 ± 143.84	262.61
(%RDA)	(60.89 ± 35.03)	(62.75 ± 25.45)	(61.53 ± 31.86)	(58.36)
Iron (mg)	6.05 ± 3.77	6.51 ± 3.54	6.21 ± 3.67	5.71
(%RDA)	(60.51 ± 37.72)	(64.92 ± 35.46)	(62.03 ± 36.74)	(55.90)

addition, girls had higher scores than boys for all food groups except for fish/poultry/meat/legumes group and hence had better diet quality and higher percentage in the fair diet quality index group (Table XI). The results also indicate that majority of the children did not consume fruits and milk or dairy products in their diets. The reason that the mothers gave when asked why their children did not consume milk or dairy product was that their children had stopped drinking milk after weaning. However, for children who did not consume any milk or dairy products (n=54), the mothers reported to give these children sweetened condensed milk combined with hot beverages e.g. Milo. The majority of the households reported that fruits were only taken once a week or once a month.

Table XII shows the distribution of children's nutritional status according to household food security. In general, households with food security had higher percentages of normal weight-for-age and height-for-age children compared to households that exhibited food insecurity. However, this trend was not seen for weight-for-height. The distribution of diet quality index and the calorie and nutrient intakes according to household food security are presented in Table XIII. As food insecurity worsened, the percentage of children having poor diet quality increased. Similarly, as food security increased, the percentage of children with fair diet quality increased. In general, intakes of calorie and several nutrients (calcium and niacin) also seemed to decrease as food insecurity worsened.

Table VII
Distribution of Male and Female Children according to RDA Categories for Calorie and Nutrient Intake (n = 64)

	< 67%			67% -100%			> 100%		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
Calorie	27 (64.3)	15 (68.2)	42 (65.6)	9 (21.4)	5 (22.7)	14 (21.9	6 (14.3)	2 (9.1)	8 (12.5)
Protein	7 (16.7)	3 (13.6)	10 (15.6)	9 (21.4)	4 (18.2)	13 (20.3)	26 (61.9)	15 (68.2)	41 (64.1)
Vitamin A	8 (19.0)	3 (13.6)	11 (17.2)	11 (26.2)	3 (13.6)	14 (21.9)	23 (54.8)	16 (72.7)	39 (60.9)
Thiamine	17 (40.5)	9 (40.9)	26 (40.6)	11 (26.2)	3 (13.6)	14 (21.9)	14 (33.3)	10 (45.5)	24 (37.5)
Riboflavin	19 (45.2)	10 (45.5)	29 (45.3)	9 (21.4)	6 (27.3)	15 (23.4)	14 (33.3)	6 (27.3)	20 (31.3)
Niacin	12 (28.6)	8 (36.4)	20 (31.3)	8 (19.0)	3 (13.6)	11 (17.2)	22 (52.4)	11 (50.0)	33 (51.6)
Vitamin C	12 (28.6)	2 (9.1)	14 (21.9)	0 (0.00)	2 (9.1)	2 (3.1)	30 (71.4)	18 (81.8)	48 (75.0)
Calcium	26 (61.9)	14 (63.6)	40 (62.5)	11 (26.2)	6 (27.3)	17 (26.6)	5 (11.9)	2 (9.1)	7 (10.9)
Iron	25 (59.5)	13 (59.1)	38 (59.4)	10 (23.8)	6 (27.3)	16 (25.0)	7 (16.7)	3 (13.6)	10 (15.6)

Table VIII
Distribution of Calories from Carbohydrates, Protein and Fat (n = 64)

	Male Mean ± SD	Female Mean ± SD	Total Mean ± SD	Total Median
Carbohydrate (%)	62.24 ± 10.85	64.90 ± 10.11	63.16 ± 10.60	64.36
Protein (%)	14.93 ± 5.30	14.88 ± 5.39	14.92 ± 5.29	14.29
Fat (%)	21.10 ± 7.81	20.22 ± 7.69	20.80 ± 7.72	20.11

Intake of calories (%RDA): Total - 63.14%; Male - 63.75%; Female - 61.96%

Discussion

The majority of the respondents reported some kind of household food insecurity with more than 50% experienced a combination of individual food insecure and child hunger. As income is one of the most important determinants of household food insecurity, we further showed that as household income decreases, it manifests in the household experiencing food insecurity. The findings indicate that food insecurity among the

Table IX
Mean Number of Servings for Food Groups according to Gender (n = 64)

Food Group		Mean ± SD	Median
Cereals, cereal products and tubers[a]			
	Total	7.10 ± 3.37	6.80
	Male	6.85 ± 3.20	
	Female	7.59 ± 3.69	
Vegetables[b]			
	Total	1.19 ± 1.09	1.00
	Male	1.08 ± 1.05	
	Female	1.39 ± 1.14	
Fruits[c]			
	Total	0.41 ± 1.02	0.00
	Male	0.32 ± 1.05	
	Female	0.57 ± 0.96	
Fish, poultry, meat and legumes[d]			
	Total	1.41 ± 1.10	1.30
	Male	1.46 ± 1.06	
	Female	1.31 ± 1.18	
Milk and dairy products[e]			
	Total	0.23 ± 0.61	0.00
	Male	0.24 ± 0.66	
	Female	0.23 ± 0.53	

Recommended number of servings for:
a = 6-10 servings ; b = 2 servings ; c = 2 servings ;
d = 2-3 servings ; e = 2 servings

poor households is primarily a direct result of inadequate income to buy sufficient foods for the household members. This finding is similar to that found among poor households in Kuala Lumpur in that household income and income per capita were risk factors for household food insecurity[22]. Olson *et al.*[5] found that household with single parents, lack of savings, larger household size, unexpected expenses and low food expenditures were more likely to experience household food insecurity. Similar findings that low socio-economic status variables (low education level, limited household income, larger household size etc.) contribute to household food insufficiency have also been reported by other researchers in various settings[4,8,23,24,25].

Although there is a strong relationship between poverty and the likelihood of food insufficiency, the use of poverty indicators such as household income and income per capita to identify household at risk of food insecurity or hunger may be misleading. This is because the income based poverty indicators do not take into consideration price differences in housing, food and health care or special needs of the households. Furthermore, annual income based poverty indicators are also static in nature and not sensitive to sudden economic changes that may contribute to temporary bouts of household food insecurity. Thus, it has been recommended that the effects of recent economic changes on

Table X
Distribution of the Male and Female Children according to Diet Quality Index (n = 64)

	Male n (%)	Female n (%)	Total n (%)
Diet Quality Index			
Poor Diet Quality[1]	31 (73.8)	13 (59.1)	44 (68.7)
Fair Diet Quality[2]	11 (26.2)	9 (40.9)	20 (31.3)
Excellent Diet Quality[3]	-	-	-

Poor diet quality[1] = diet quality index scores of 0 - 4, Fair diet quality[2] = diet quality index scores of 5 - 9, Excellent[3] = diet quality index score of 10

Table XI
Food Group Scores and Mean Scores of Food Groups according to Gender (n = 64)

Food Group	Score	Male n (%)	Female n (%)	Total n (%)	Male Mean±SD	Female Mean±SD	Total Mean±SD	Median
Cereals, cereal products and tubers	0	6 (14.3)	2 (9.1)	8 (12.5)	1.48±0.74	1.50±0.67	1.48±0.71	2.00
	1	10 (23.8)	7 (31.8)	17 (26.6)				
	2	26 (61.9)	13 (59.1)	39 (60.9)				
Vegetables	0	22 (52.4)	5 (22.7)	27 (42.2)	0.69±0.81	1.00±0.69	0.80±0.78	1.00
	1	11 (26.2)	12 (54.5)	23 (35.9)				
	2	9 (21.4)	5 (22.7)	14 (21.9)				
Fruits	0	36 (85.7)	15 (68.2)	51 (79.7)	0.19±0.51	0.45±0.74	0.28±0.60	0
	1	4 (9.5)	4 (18.2)	8 (12.5)				
	2	2 (4.8)	3 (13.6)	5 (7.8)				
Fish, poultry, meat and legumes	0	12 (28.6)	6 (27.3)	18 (28.1)	1.00±0.77	0.86±0.64	0.95±0.72	1.00
	1	18 (42.9)	13 (59.1)	31 (48.4)				
	2	12 (28.6)	3 (13.6)	15 (23.4)				
Milk and dairy products	0	36(85.7)	18 (81.8)	54 (84.4)	0.21±0.56	0.23±0.53	0.22±0.55	0
	1	3 (7.1)	3 (13.6)	6 (9.4)				
	2	3 (7.1)	1 (4.5)	4 (6.2)				
Total					3.57±1.86	4.05±1.70	3.73±1.81	4.00

Score: 0 = individual with poor diet (consume no serving within a food group)
1 = individual who did not meet dietary goal but had a fair diet
2 = individual who met a dietary goal

Table XII
Distribution of Nutritional Status according to Household Food Insecurity Levels (n = 64)

Nutritional Status Indicator	Food Secure (n=12) (%)	Household Insecure (n=13) (%)	Individual Insecure (n=21) (%)	Child Hunger (n=18) (%)
Weight for age				
Significantly underweight	5 (41.7)	6 (46.2)	10 (47.6)	8 (44.4)
Mildly underweight	4 (33.3)	6 (46.2)	8 (38.1)	9 (50.0)
Normal	3 (25.0)	1 (7.6)	3 (14.3)	1 (5.6)
Height for age				
Significantly stunted	4 (33.3)	4 (30.8)	12 (57.2)	13 (72.2)
Mildly stunted	3 (25.0)	8 (61.5)	7 (33.3)	5 (27.8)
Normal	5 (41.7)	1 (7.7)	2 (9.5)	-
Weight for height				
Significantly wasted	2 (16.7)	1 (7.7)	2 (9.5)	-
Mildly wasted	4 (33.3)	7 (53.8)	4 (19.0)	6 (33.3)
Normal	6 (50.0)	5(38.5)	14 (66.7)	12 (66.7)
High	-	-	1 (4.8)	-

Table XIII
Distribution of Diet Quality Index and Calorie and Nutrient Intakes of Children according to Household Food Insecurity Levels (n = 64)

	Food Secure (n=12) %	Household Insecure (n=13) %	Individual Insecure (n=21) %	Child Hunger (n=18) %
Diet Quality Index				
Poor diet quality	50.0	53.8	81.0	77.8
Fair diet quality	50.0	46.2	19.0	22.2
Calorie and nutrient intake (%RDA) Mean ± SD				
Calorie	67.29±23.84	78.68±28.31	52.86±27.65	61.13±20.19
Protein	146.26±65.75	177.59±70.35	144.83±103.82	123.21±45.42
Vitamin A	153.71±51.81	164.98±95.31	112.22±79.02	112.30±58.19
Thiamine	111.64±30.02	124.90±81.72	71.10± 46.73	86.06±54.12
Riboflavin	93.53±43.11	108.64±59.41	64.45± 40.35	68.34±32.73
Niacin	128.69±63.73	145.54±68.28	111.30±80.95	90.22±40.66
Vitamin C	255.34±182.60	228.51±132.89	206.27±196.63	269.35±235.61
Calcium	74.88±18.86	72.40±36.94	54.68±37.39	52.77±23.85
Iron	81.99±32.56	85.74±48.61	46.40±24.46	49.82±27.81

household budgets such as unexpected expenses, lost of jobs or gaining a new household member in the recent months be taken into consideration when looking at the relationship between poverty and food insecurity[26]. This helps to explain our finding that only 23.8% of the households having income per capita above RM100 (poverty line) were food secure. Perhaps, even with higher incomes, the incomes are allocated for expenses (expected and unexpected) other than food[27].

The prevalence of underweight and stunting among the Temuan preschoolers in this present study are similar to that of other studies on Orang Asli children. Zaitun[28] who conducted a study on Temuan preschoolers (4 - 6 years old) found that more than 50% of boys and girls were underweight and stunted. The higher prevalence of stunting than underweight seen in our sample of Temuan children was also reported among Semai children. In a study by Ismail *et al.*[13], the prevalence of underweight and stunting were 52% and 60% respectively for children aged 4 - 6 years old, while Massita[29] reported that 33.3% and 38.8% of the Semai children (0 - 8 years old) were underweight and stunted. Khor[12] reported that among Semai children, 53% boys and 49% girls (1 - 6 yearls old) were underweight while 73.2% boys and 62.7% girls were stunted. Despite the high prevalence of underweight and stunting, the prevalence of significant wasting among the Temuan preschoolers in this study was relatively low (7.8%) but was similar to the prevalence (8%) reported by Ismail *et al.*[13]. The low mean z scores for weight-for-age and height-for-age among these children may reflect that their weights have been adapted to their low stature thus resulting in the children having body weights which appeared appropriate for their stunted heights. In addition to the poor growth attainments, the Orang Asli children too have been reported to have poor health status, perhaps due to the combination of

various health and environmental factors such as poor hygiene practices and environmental sanitation, repeated infections and inadequate food intakes[30].

Dietary studies of Orang Asli children have consistently shown that these children did not have adequate caloric intake[12,13,28,29]. In this present study, more than 50% of the children had caloric, calcium and iron intakes less than 2/3 RDA. However, for other nutrients, the mean intakes were adequate (thiamine and riboflavin) or more than the RDA (protein, vitamin A, niacin and vitamin C). Zaitun[29] also found similar finding in that the Temuan preschoolers in Kuala Pilah had inadequate caloric intake but the protein intake exceeded the RDA. Among the Semai children, several studies have reported that these children not only had inadequate caloric intake but also other nutrients such as protein, calcium, iron, vitamin A, thiamine and niacin. The low intakes of these nutrients could well be due to the lack of meat, milk and dairy products and fruits and vegetables in the diet of the children[12,13,28].

Further analyses were carried out to determine the diet quality of these children - the number of servings from each food group. These analyses were done to facilitate in the explanation for the nutrient intakes of the children according to the RDA. Although the children had adequate number of servings from the cereals/cereal products and tuber group, the number of servings from the milk/dairy products group was inadequate. More than 80% of the preschoolers did not have milk or dairy products as part of their daily diet and they rarely consumed meat or poultry. Although they consumed fish, the number of servings of fish consumed may not be adequate to provide sufficient iron in the diet. These low food group intakes may explain the low caloric, calcium and iron intakes among the children as these food groups provide most of the essential nutrients (fat, protein, vitamins and minerals) in the diet. Thus, the inadequate intakes of calorie, iron and calcium may contribute to the current growth failure among the children and may also put them at risk of iron deficiency anemia and poor bone health. Surprisingly, the average protein intake was adequate despite the low consumption of meat or poultry and milk/dairy products. The high intake of protein was due to a combination of plant and animal proteins such as fish and rice. The fair intakes of meat/poultry/fish/legume and cereal/cereal products/tuber group could have also contributed to the high intake of the B vitamins. Although fruits were rarely taken by the children, the consumption of green leafy vegetables such as tapioca shoots and swamp cabbage may contribute to the high vitamin A and C intakes. However, the intake of the B vitamins (niacin, riboflavin and thiamine) and vitamin C may also be less than the reported levels in that the food database of Malaysia for these vitamins did not take into account the losses that occur during food preparation and cooking. For example, losses of 40 - 70% of vitamin C can occur through leaching into the cooking water or destruction by heat. Thus, the actual intake could well be between 70 - 140% of the RDA instead of 237.7% as reported. Osman *et al.*[20] reported that rice is the staple for the Temuan but they also depended on tapioca as a source of energy and carbohydrate. Fish and eggs were the main protein sources, while meat was rarely taken and fruits and vegetables were taken at least once a week. The inadequate food intakes among these Orang Asli, contributed to their lower intakes of calories and nutrients and poorer nutritional status when compared to the Malays[14].

The potential consequences of food insecurity include hunger, malnutrition and negative effects on health and quality of life (physical, social and mental well-being)[31]. In this present study we looked at dietary intake and anthropometric measurements of the preschoolers as proxies of hunger and malnutrition. Although the trend of better nutritional status as food security improves was not consistent among the three nutritional indicators (especially wasting), the trend that the children had better diet quality as households reported improved food security was observed. The finding that nutritional status may not be a

good outcome measurement for food insecurity was also found among preschoolers from low income households in Kuala Lumpur[25]. There may be several reasons to explain this consistent finding. First, the assessment of nutritional status of children using the anthropometric indicators may not be sensitive enough to detect disturbances in nutritional status over short period of time. Perhaps, other methods such as biochemical and clinical assessments may be more appropriate to determine the health outcomes of food insecurity. Second, the etiology of malnutrition is very complex in that there are many variables operating as risk factors including diet inadequacy, recurrent infections, birth weight, socioeconomic and health status. Food insecurity, however, can but does not necessarily result in malnutrition.

In general, we found that the diet quality of the preschoolers decreased as household food insecurity worsened. This may be due to the limited available food for consumption, thus restricting the diversity and consequently the quality of the diet. Several studies have also reported that as food insecurity increases, the quantity of food available in the households, the consumption of fruits and vegetables and the mean food and nutrient intakes of women tend to decrease[7,8,32].

There are several limitations to this study that need to be highlighted which may have some bearings to the study findings. First, as the study is a cross-sectional survey, it is not able to determine the consequences of household food insecurity. Instead, only association between household food insecurity and nutritional status can be inferred. Second, the duration of the study was limited for inclusion of more subjects. Therefore, the sample size of this study may be too small for any statistical analysis to be conducted (e.g. ANOVA, Chi Square) and to be representative of the overall population at risk. Third, anthropometry measurements are relatively insensitive in detecting disturbances in nutritional status over a short period of time. In addition, growth disturbances induced by micronutrient deficiencies (e.g. zinc) cannot be distinguished from those caused by macronutrient imbalances. Finally, the reliance on self reported data may suggest that the accuracy of the data is dependent on the respondent's honesty and memory during the data recall.

Conclusion

The poor nutritional status of the Orang Asli children which was indicated by the high prevalence of underweight, stunting and wasting and inadequate food and nutrient intakes is a major health problem that should be addressed by the various government agencies such as Ministry of Health, JHEOA, Ministry of Rural Development and Ministry of Agriculture. Routine health and nutrition monitoring should be conducted as preventive measures against illnesses or diseases during childhood and consequently adulthood. The land surrounding each household can be utilized to increase food availability e.g. subsistence agriculture (corn, vegetables and fruits) that could increase the household food supply should be recommended to ensure that the household would at least have some food to consume when household food availability is low. Surplus of these food items can also be sold to generate additional income. In addition, small rural industry especially for womenfolk who are homemakers could be initiated. This again will help them to generate additional income for their families and increase food availability as well as diet diversity. Studies have shown that women who contribute to household income and have control of the income may increase household food security and consequently have children with better nutritional status[3,33,34].

The relationship between food insecurity and its risk factors and potential consequences are still empirical questions that need extensive research. Our study has shown that in this sample of Temuan households, household income, income per capita and diet quality seemed to be

promising variables for risk factors and outcomes of food insecurity. Also, the findings on food insecurity (risk factors and consequences) and the association between the nutrient intakes according to RDA and food group scoring provide some aspects of validation for the two instruments that have been used in this study - Radimer/Cornell hunger and food insecurity instrument and Diet Quality Index. However, it is recommended that more research be conducted to identify the risk factors and consequences of food insecurity among other ethnic groups in various settings and to validate these instruments for future use in our population. Food insecurity will no doubt be a major health and economic issues as Malaysia progresses in development and thus the indicators of food insecurity should be a necessary component of the core measures of health and nutritional status of individuals, communities and nations.

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