ARTICLE

Assessing Food Insecurity and Its Association with Nutritional Status of Children in Pengkalan Kubor, Kelantan

A. Nur Nasihah, A. Asma' *, and Z. Noor Salihah

School of Food Science and Technology, Universiti Malaysia Terengganu, Terengganu, Malaysia

E-mail: asma.ali@umt.edu.my

Food insecurity is the condition of unavailability of adequate and safe food for consumption. It is a worldwide problem. Children who experienced food insecurity may suffer from poor health and nutritional outcomes. The main aim of this study is to assess food insecurity and its association with nutritional status among children in Pengkalan Kubor, Kelantan. The objectives are: (1) to assess the food security status in that area (using Radimer/Cornell Hunger scale); (2) measure the nutritional status of the children (based on height-for-age, weight-for-age, and BMI-for-age according to WHO z-score categorization); and (3) measure the association between food insecurity and children's nutritional status. This cross-sectional study involved 71 pairs of mothers and children ranging from two to six years old. Results show that 47.9% were food secure and 52.1% were food insecure. Of the food insecure group, 38.7% were categorized as household food insecure, 38.7% as individual food insecure, and 22.5% as suffering from child hunger. Based on height-for-age, 40.8% were severely stunted, 35.2% were stunted, and 23.9% had normal height. For weight-for-age and BMI-for-age, most of them were within the normal range at 40.8% and 33.8%, respectively. No significant association was found between food insecurity and nutritional status of children at $p<0.05$. These results should raise concerns about food security among relevant health organizations, government ministries, and other stakeholders. Increasing food security may improve the nutritional status of children and thus their quality of life.

.

Introduction

Many studies have been carried out to assess household food insecurity in Malaysia. A study in Kuala Lumpur found that 27.7% of the households were food insecure, 10.9% of individuals were food insecure, and 27.0% fell into the child hunger category (Shariff and Ang, 2001). Another study conducted in Sabak Bernam, a rural community in Selangor, reported that 58% of households experienced some kind of food insecurity (Shariff and Lin, 2004). Meanwhile, a recent study carried out at the Northeastern Peninsular Malaysia reported that about 16.1% of households were food secure and 83.9% of them had experienced some kind of food insecurity (Ali Naser et al., 2014). Studies have shown that among low income rural communities, 50% or more of households face some level of food insecurity, with a child hunger rate of 34.5% (Shariff and Lin, 2004).

Kelantan has among the highest rate of severe malnutrition among children compared to other states in Malaysia and is among the top leading states in Malaysia benefitting from the food basket assistance program for the poor (Ali Naser et al., 2014). Based on a study conducted in Bachok, a district in Kelantan, the findings revealed that most of undernourished children were experiencing household food insecurity (Ali Naser et al.,

2014). Children from food insecure households have higher probability to be underweight and stunting than those from food-secure households (Assefa et al., 2013). A recent study done in Kelantan showed that prevalence of underweight, stunting, and wasting among food insecure children in Kelantan were 61.0%, 61.4% and 30.6%, respectively (Ali Naser et al., 2015). It was found that low socio-economic status is highly related to household food insecurity. Characteristics of low socio-economic status are reflected in low monthly household income, low income per capita, low educational level, unemployment among adult members and large households. It is common for low-income households to experience food insecurity, as poverty is the principal cause of food insecurity (Shariff and Lin, 2004).

Food insecurity among children is strongly related to lower intake of macro- and micronutrient, fruits and vegetables, and lack of diet diversity. These contribute to the higher prevalence of either underweight or overweight and obesity, higher or lower blood cholesterol levels, lower serum albumin, lower hemoglobin, disordered eating behaviors, and adverse physical and mental health (Mohamadpour et al., 2012). Food insecurity also leads to higher rates of the birth defects anencephaly and spina bifida (Charmicael et al., 2007), anemia, cognitive

problems, anxiety and other health issues (Howard et al., 2011).

Therefore, this study aims to assess the food insecurity status and its association with nutritional status of children in Pengkalan Kubor, Kelantan. The objectives are: (1) to assess the food security status in that area (using Radimer/Cornell Hunger scale); (2) measure the nutritional status of the children (based on height-for-age, weight-for-age, and BMI-for-age according to WHO z score categorization); and (3) measure the association between food insecurity and children's nutritional status.

Materials and Methods

Subjects

This cross-sectional study involved 71 pairs of parents (father/mother) and children (ranging from 2 to 6 years old) from Pengkalan Kubor who were purposively selected. Either father or mother were eligible to be selected and interviewed on behalf of their children. Using the Cochran formula, the minimum sample size was calculated. Given the estimated prevalence of food insecurity of 83.9% in Kelantan (Ali Naser et al., 2014), 95% confidence level, and desired precision of 0.1, the sample size derived was 52. However, to increase the response rate to more than 35%, the sample size was increased to 71.

Sampling Plan

In this study, non-probability sampling was used for respondent sampling and area sampling. For area and respondent sampling, a purposive sampling technique was applied. Purposive sampling was used. This is a sampling technique involving the selection of a specific area/sample (Engel and Schutt, 2009). In this study, only parents with children aged two to six years were purposively selected to answer the questionnaire. For area sampling, Pengkalan Kubor was purposely selected, as shown in Fig. 1. Pengkalan Kubor is one of the areas located in Tumpat, Kelantan. Based on the official portal published network (E-Poverty), Tumpat has a high rate of poverty. Tumpat had a poverty rate of 33.9% as compared to Bachok at 21.2% and Pasir Mas at 10.1%. Tumpat is divided into seven areas, including Pengkalan Kubor. Among the seven areas, Pengkalan Kubor had the highest rate of poverty. 17% (n=154) of the area's population is classified as poor. Poor status is classified as having monthly household income lower than RM520.00, with an income per capita for a household at RM130.00 for a family of four (ICU JPM, 2016).

Data collection

This study was conducted from 18 July, 2016, until 3 August, 2016. All parents signed the informed consent form prior to data collection.

Research instrument

In this study, a questionnaire consists of three sections was used. The three sections were a) socio-demographic background; b) food insecurity; and c) nutritional status. The first section aims to assess the socio-economic status of the household. This includes age of mother/father, educational background of mother/father, household size, number of schooling children, employment status, and monthly household income. The second section measured the food security level within the household using a validated Malay language Radimer/Cornell Hunger scale. The Radimer/Cornell Hunger scale consists of ten items derived from four components: quantity of food, quality of food, food acceptability, and certainty of getting food, as shown in Table 1. The instrument reflects four levels of food insecurity with increasing severity. These levels are food secure (negative answers to all hunger and food insecurity items); food insecure household (positive answers to one or more items of item 1 to 4) but not to adult or child level items; food insecure individual or adult (positive answers to one or more of items 5 to 8 but not to items 9 and 10); and child hunger (positive answer to items 9 and 10).
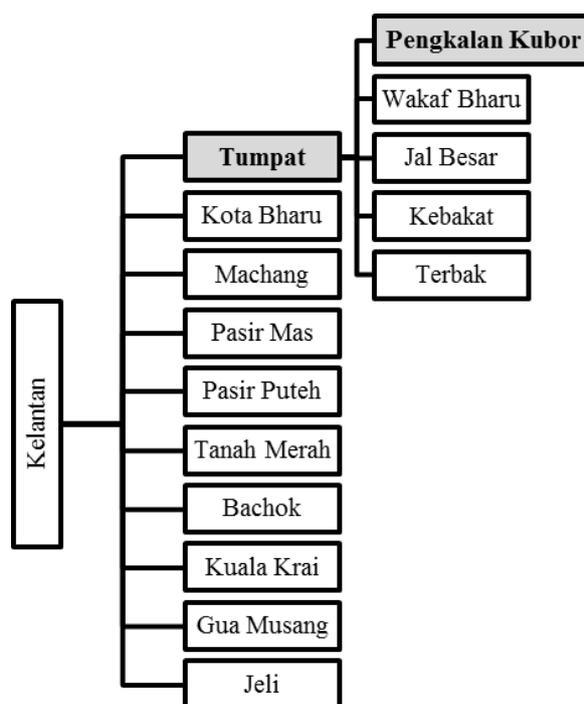

Fig. 5: Sampling Framework

The third section measured the nutritional status of the children. Weight and height of the children were measured using a weighing scale and a portable stadiometer. These were recorded and plotted on WHO growth charts (growth charts include BMI-for-age, height-for-age and weight-for-age) to get their z-score value (ranging from 3 to -3 for all indices). The categorization of nutritional status based on z-score value is shown in Table 2.

Table 2: Radimer Cornell Food Insecurity Questionnaire

Items	Components
	Household level
Item 1	I worry that if the food or raw materials for cooking will run out before I could have more money to buy food.
Item 2	Food or raw materials for cooking that I bought for my family at home is always run out fast and I do not have the money to buy food again.
Item 3	I do not have enough food or raw materials to cook or prepare a family meal (breakfast, lunch and dinner) and I did not have enough money to buy more.
Item 4	We eat the same thing for several days in a row because we only have a few different kinds of food on hand and don't have money to buy more.
	Individual level
Item 5	I am often hungry but I don't eat because I do not have enough money to buy food.
Item 6	I only eat a little of what I should eat because I don't have enough money to buy food.
Item 7	I was not able to eat properly or eat to satiety because I don't have enough money to buy food.
	Child level
Item 8	My children do not eat enough or always lack of food because I am not able to buy enough food.
Item 9	I know sometimes my children are hungry, but I cannot do anything because I am not able to buy food in excess of what I always buy.
Item 10	I am not able to provide a balanced meal to my children because I do not have enough money to provide food.

Table 3: Nutritional status based z-score categorization

Status	Z-score value	Category
Height-for-age	3	Tallness
	2, 1, 0, -1	Normal
	-2	Stunted
	-3	Severely stunted
Weight-for-age	3, 2, 1	Obese, overweight
	0, -1	Normal
	-2	Underweight
	-3	Severely underweight
BMI-for-age	3	Obese
	2	Overweight
	1	Possible risk of overweight
	0, -1	Normal
	-2	Wasted
	-3	Severely wasted

Data analysis

Data were analyzed using SPSS software version 22.0. A normality test was used to check for data normal distribution. Descriptive statistics were used to depict mean or median. The chi-square test was applied to determine the association between food insecurity status and the nutritional status of children.

Results and Discussion

Socio-demographic profile of respondents

This study involved 71 pairs of mother and children. Table 3 shows the socio-demographics of the respondents. In this study, most mothers ranged from 30 to 39 years old, had education until secondary school, had four to six members in their household, and work by themselves with a monthly income less than RM800.

Level of food insecurity among respondents

In this study, 52.1% of the respondents were reported to be food insecure, while the remaining 47.9% were food secure. The food insecure respondents were then categorized into three different of food insecure levels. Of the food insecure respondents, 38.7% were classified as household food insecure, 38.7% were individual food insecure, and 22.5% were child food insecure. A previous study conducted in Kelantan showed that 16.9% of households were food secure, while 83.9% were food insecure and 29.6% of them were classified as household insecure. Additionally, 19.3% were individual insecure, and another 35% reported child hunger (Ali Naser et al., 2015). The percentage of respondents experiencing food insecurity in this study were much lower than the previous study done in Kelantan. This may be due to differing socio-demographic factors which may have changed over the years. Another plausible reason is the difference during the selection of respondents. The previous study only included those that received financial support from the Department of Welfare in that specific area, in contrast to this study, which did not have any specific criteria in regard to financial support. Therefore, perhaps the current respondents are receiving financial assistance from a few other sources than the local department of welfare, which may aid in maintaining an adequate and safe food supply for their household.

Comparison of socio-demographic between food secure and food insecure among respondents

A chi-square test was applied to determine the association between food security status and socio-demographic. Due to small sample size, most of the cells appeared to have more than 20% of expected count less than 5. This violates the rules of chi-square. Therefore, all socio-demographic characteristics were clumped into smaller categories as shown in Table 4 prior to chi-square analysis.

From the findings, only education level (χ^2(1, N = 71) = 6.943, p< 0.05) and total household monthly income (χ^2(1, N = 71) = 9.654, p< 0.05) appeared to have a significant association with food security status.

Mothers in food insecure households are less likely to have furthered their studies after high school. In this study, mothers from food insecure households were reported to have lower education that food secure households.

Table 4: Socio-demographic background of respondent (n = 71)

Variables	Food secure n (%)	Food insecure n (%)	Total n (%)
Age			
<19	0 (0.0)	4 (5.6)	4 (5.6)
20-29	9 (12.7)	8 (11.3)	17 (24.0)
30-39	12 (16.9)	15 (21.1)	27 (38.0)
40-49	10 (14.1)	7 (9.9)	17 (24.0)
>50	3 (4.2)	3 (4.2)	6 (8.4)
Education			
Primary school	2 (2.8)	3 (4.2)	5 (7.0)
Secondary school (SPM)	16 (22.5)	29 (40.8)	45 (63.4)
STPM	8 (11.3)	4 (5.6)	12 (16.9)
Higher education	8 (11.3)	1 (1.4)	9 (12.7)
Household size			
3	5 (7.0)	3 (4.2)	8 (11.2)
4-6	20 (28.2)	23 (32.4)	43 (60.6)
7-9	9 (12.7)	11 (15.5)	20 (28.2)
No of children went to school			
None	4 (5.6)	4 (5.6)	8 (11.2)
1-2	17 (23.9)	21 (29.6)	38 (53.5)
>3	13 (18.3)	12 (16.9)	25 (35.2)
Employment status			
Government sector	11 (15.5)	2 (2.8)	13 (18.3)
Private sector	3 (4.2)	4 (5.6)	7 (9.9)
Work by themselves	16 (22.5)	20 (28.2)	36 (50.7)
Not working	4 (5.6)	11 (15.5)	15 (21.1)
Monthly income (RM)			
$\leq$800	6 (8.5)	22 (31.0)	28 (39.4)
801-1000	9 (1.3)	9 (1.3)	18 (25.4)
1001-1200	6 (8.5)	3 (4.2)	9 (12.7)
1201-1500	7 (9.9)	3 (4.2)	10 (14.1)
$\geq$1501	6 (8.5)	0 (0.0)	6 (8.5)
No of person contribute to household income			
None	17 (23.9)	23 (32.3)	40 (56.3)
1	13 (18.3)	11 (15.5)	24 (33.8)
2	4 (5.6)	1 (1.4)	5 (7.0)
3	0 (0.0)	2 (2.8)	2 (2.8)
Total household income (RM)			
$\leq$1000	8 (11.3)	27 (38.0)	35 (49.3)
1001-2000	16 (22.5)	9 (1.3)	25 (35.2)
2001-3000	6 (8.5)	1 (1.4)	7 (9.9)
$\geq$3001	4 (5.6)	0 (0.0)	4 (5.6)

Table 5: Association between food security and socio-demographic level

Variables	Food secure Yes N	No N	χ^2	p-value
Age				
< 40	21	27	1.016	0.447
40 and above	13	10		
Education				
Less than higher education	26	36	6.943	0.011*
Higher education	8	1		
Household size				
< 7	25	26		
$\geq$ 7	9	11	0.093	0.797
No of children went to school				
< 3	21	25	0.262	0.629
$\geq$ 3	13	12		
Employment status				
Working	30	26	3.432	0.084
Not working	4	11		
No of person contribute to household income				
None	17	23	1.065	0.345
$\geq$ 1	17	14		
Total household income (RM)				
$\leq$ 2000	24	36	9.654	0.02*
> 2000	10	1		

* Significant at $p < 0.05$

Previous studies have found that education can improve food security status by providing a good resource management skills and improving the individual dietary behavior (Farrell, 2014). The prevalence of household food insecurity is significantly higher for the children of uneducated parents (Ali Naser et al., 2014). Based on observations in the United States by Organization for Economic Co-operation and Development countries, households with uneducated mothers are more vulnerable to food insecurity. Thus, the prevalence of food insecurity was higher among children of uneducated or low socio-economic status parents.

A significance difference in total household monthly income was found between food secure and food insecure households, as shown in Table 4. A majority of the food insecure households had total household incomes of less than RM1000. This is aligned with previous studies that have shown a significant association between food insecurity and level of income in a household (Ferdoushi et al., 2013). Many of food insecure household live below the poverty line. Families from low

socio-economic status are less likely to have the financial resources to buy nutritious or sufficient food for the family. Therefore, a large proportion of children from low socio-economic status have a high prevalence of malnutrition (Matheson et al., 2002).

Nutritional Status of Children

The three most commonly used anthropometric indices to assess children growth status are weight-for-height, height-for-age, and BMI-for-age. Table 5 shows the nutritional status of children in Pengkalan Kubor based on the three indices.

Table 6: Growth indicator (Ht-for-age, Wt-for-age, BMI-for-age) of children in Pengkalan Kubor (n=71)

Nutritional status	Frequency n (%)
Height-for-age (*Ht-for-age*)	
Normal	17 (23.9)
Stunted	25 (35.2)
Severely stunted	29 (40.8)
Weight-for-age (*Wt-for-age*)	
Overweight	12 (16.9)
Normal	29 (40.8)
Underweight	23 (32.4)
Severely underweight	7 (9.9)
BMI-for-age (*BMI-for-age*)	
Obese	9 (12.7)
Overweight	8 (11.3)
Possible risk of overweight	18 (25.4)
Normal	24 (33.8)
Wasted	6 (8.5)
Severely wasted	6 (8.5)

Height-for-age is used to measure the children height with the proportion of their age. It reflects attained growth in length or height at the child's age during data collection. From the findings, about 35% and 41% of the children aged two to six years were stunted or severely stunted, respectively. This contrasts with findings from a large-scale study done in Malaysia known as SEANUTS Malaysia (Nutrition Survey of Malaysian Children) involving all areas in Malaysia, which reported that the prevalence of stunting in Malaysian children was 8.4% (Poh et al., 2013). Their findings were much lower than those of this study. This may be due to the SEANUTS Malaysia study is generalizable to the whole Malaysian children and may not represent any specific areas including Pengkalan Kubor, Kelantan. Meanwhile, a study carried out by Ali Naser et al., (2015) among low-income households in a district in Kelantan found that the prevalence of stunting was 61.4%, which is higher than this current study. One plausible reason is that the previous study was specifically performed only among low-income households. With more low-income respondents, the possibility of having poor nutritional status is higher, as the primary contributor to food insecurity and poor children's nutrition is low household income. They might experience difficulties in accessing safe and nutritious food. Thus, children not from low-income households may be less likely to experience food insecurity and perhaps have a better nutritional status.

Weight-for-age was used to measure children weight where it reflects body weight relative to the child's age during data collection. Findings showed that most of the children had a normal weight-for-age (n=29, 41%). This was then followed by 32% of underweight, which is higher than the national prevalence of underweight, 13.0% (National Health and Morbidity Survey, 2015). However, a study conducted in Pasir Mas, Kelantan found that the percentage of underweight children was 51.4% (Ruhaya et al., 2012), which is quite similar to this study. This may be due to similarities in their geographical and socio-demographic status.

BMI-for-age has been recommended for screening obesity, overweight, and underweight among children. Findings show that most respondents had a normal BMI (n=24, 33.8%), followed by having possible risk of overweight (n=18, 25.4%), obese (n=9, 12.7%), and overweight (n=8%, 11.3%). The results were quite similar with the national prevalence of obesity where 11.9% and 12.7% of the children were overweight and obese, respectively (National Health and Morbidity Survey, 2015).

Table 7: Association between food security and children's nutritional status

Growth indicator	Status of food security	Nutritional status Normal (n)	Not normal (n)	χ^2	*p*-value
Height-for-age	Yes	7	27	0.142	0.707
	No	9	28		
Weight-for-age	Yes	15	19	0.289	0.591
	No	12	23		
BMI-for-age	Yes	9	25	1.568	0.211
	No	15	22		

Association between food insecurity and children's nutritional status

A chi-square test was applied to determine any association between food security status and children's nutritional status (i.e. weight-for-height, height-for-age and BMI-for-age). However, no significant association was found between food security status and height-for-age χ^2 (1, N = 71) = 0.142, $p > .05$, weight-for-age χ^2 (1, N = 71) = 0.289, $p > .05$, and BMI-for-age χ^2 (1, N = 71) = 1.568, $p > .05$ as shown in Table 6. The results are quite similar with a study done in Kuala Lumpur in which no significant association was found between food security and nutritional status of children. This also contrasts with findings from a study done in Kelantan in which food insecurity was significantly associated with underweight among children (Ali Naser et al., 2015). The results may vary due to the limitation of subjects involved in the study.

Conclusions

Food insecurity in Pengkalan Kubor, Kelantan is considered high, as more than half of the respondents were food insecure. The nutritional status of the children was not in an optimal range, since most of them were not within the normal range for height-for-age, weight-for-age and BMI-for-age. Interestingly no significant association was found between food insecurity and nutritional status of the children in this study. Therefore, more research is required to fully understand the occurrence of food insecurity and associations between its variables.

The high prevalence of food insecurity in Pengkalan Kubor supports the need for continuing programs aimed at improving food security and nutritional status of these children and their families. The numbers of stunted, obese, and underweight children were quite high as compared with national prevalence. Thus, health-related agencies, government ministries, and other stakeholders should take immediate action towards improving children's development and growth. Increasing food security will help improve the nutritional status of children and improve their quality of life.

Conflict of Interest

All the authors declare that they have no conflict of interest.

References

1   Ali Naser, I., Jalil, R., Muda, W., Manan, W., Nik, W., Suriati, W., Mohd Shariff, Z. and Abdullah, M.R. (2014). Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia. Nutrition research and practice, **8(3),** pp.304-311.

2   Ali Naser, I., Jalil, R., Muda, W., Manan, W., Nik, W., Suriati, W., Mohd Shariff, Z. and Abdullah, M.R. (2015).Assessment of Food Insecurity and Nutritional Outcomes in Bachok, Kelantan. Journal of Nutrition and Food Sciences, 5(3), p.1.

3   Assefa, H., Belachew, T., and Negash, L. (2013) Socioeconomic Factors Associated with Underweight and Stunting among Adolescents of Jimma Zone, South West Ethiopia: A Cross-Sectional Study. ISRN Public Health Volume 2013

4   Carmichael, S. L., Yang, W., Herring, A., Abrams, B., and Shaw, G. M. (2007). Maternal Food Insecurity Is Associated with Increased Risk of Certain Birth Defects. The Journal of Nutrition, 137(9), 2087–2092.

5   Schutt, R. K., Engel, R. J. (2008) Sampling. In: The Practice of Research in Social Work. 3rd ed., Ch. 5. Washington DC: SAGE Publications Inc. Available from: http://www.sagepub.com/upm-data/24480_Ch5.pdf. [Last accessed on 2016 Sep 24]

6   Farrell, J. A. (2014). The impact of nutrition education on food security status and food-related bahaviors, (February). Retrieved from http://scholarworks.umass.edu/theses\nhttp://scholarworks.umass.edu/theses/103

7   Ferdoushi, A., and Chamsuri, S. (2013). Food Security Status, Issues and Challenges in Malaysia: A Review. Journal of Food and Agriculture Environment 11(2): 219-223.

8   Howard, L. L. (2011) 'Does food insecurity at home affect non-cognitive performance at school? A longitudinal analysis of elementary student classroom behavior', Economics of Education Review, **301**, pp. 157–76

9   Implementation Coordination Unit, Prime Minister's Department (ICU JPM) (2016). Available from: www.icu.gov.my. [Last accessed on 2016 Sep 10]

10 Matheson, D.M., Varady, J., Varady, A., and Killen, J.D. (2002). Household food insecurity and nutritional status of Hispanic children in the fifth grade. American Journal of Clinical Nutrition **76**: 210–217.

11 Mohamadpour, M., Mohd Sharif, Z., and Avakh Keysami, M. (2012). Food Insecurity, Health and nutritional status among sample of Palm-Plantation households in Malaysia. Journal of Health, Population and Nutrition, 30(3), 291–302.

12 National Health and Morbidity Survey (2015). Available from: http://www.iku.gov.my/images/IKU/Document/REPORT/nhmsreport2015vol2.pdf [Last accessed on 2016 Sep 15]

13 Poh, B. K., Ng, B. K., Siti Haslinda, M. D., Nik Shanita, S., Wong, J. E., Budin, S. B., Ruzita, A. T., et al., (2013). Nutritional status and dietary intakes of children aged 6 months to 12 years: findings of the Nutrition Survey of Malaysian Children (SEANUTS Malaysia). British Journal of Nutrition, 110(S3), S21–S35. Cambridge University Press.

14 Radimer, K.L., Olson, C.M., and Campbell, C.C. (1990). Development of indicators to assess hunger. Journal of Nutrition 120: 1544 - 1548.

15 Radimer, K.L., Olson, C.M., Greene, J.C., Campbell, C.C., and Habicht, J. (1992). Understanding hunger and developing indicators to assess it in women and children. Journal of Nutrition Education 24 (1): 36S - 44S.

16 Ruhaya, H., Jaafar, N., Jamaluddin, M., Ismail, A. R., Ismail, N. M., Badariah, T. C. and Mohamed, S. Z. (2012). Nutritional status and early childhood caries among preschool children in Pasir Mas, Kelantan, Malaysia. Arch Orofac Sci, 7(2), 1-7.

17 Shariff, Z. M., and Ang, M. (2001). Assessment of food insecurity among low income households in Kuala Lumpur using the Radimer/Cornell food insecurity instrument–a validation study. Malaysian Journal of Nutrition, 7(1 and 2), 15-32.

18 Shariff, Z. M., and Lin, K. G. (2004). Indicators and nutritional outcomes of household food insecurity among a sample of rural Malaysian women. Journal of Nutrition, 30, 50-55.