PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 11 (10): 967-973, 2012
ISSN 1680-5194

Food Expenditure and Diet Diversity Score are Predictors of Household Food Insecurity among Low Income Households in Rural District of Kelantan Malaysia

A.N. Ihab[1], A.J. Rohana[1], W.M. Wan Manan[2], W.N. Wan Suriati[2], M.S. Zalilah[3] and A.M. Rusli[1]
[1]Department of Community Medicine, School of Medical Sciences,
[2]Program of Nutrition and Dietetics, School of Health Sciences,
Health Campus, Universiti Sains Malaysia Kubang Kerian, 16150 Kelantan, Malaysia
[3]Program of Nutrition and Dietetics, Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia, Serdang 43400 Selangor, Malaysia

Abstract: Food insecurity has always been associated with low purchasing power and inadequate dietary intake in terms of quality and quantity. The aim of this study is to identify the relationship between household food insecurity, food expenditure and diet diversity in low income households in rural Malaysia. A cross-sectional survey of low-income households was conducted in 223 households of mothers aged 18 to 55 years old. Non-lactating and non-pregnant mothers were purposively selected. A questionnaire was administered. Items on socio-demographic characteristics and food expenditures of eight food groups were rated on the Radimer/Cornell scale. Diet diversity scores were analyzed from the food frequency questionnaire. Approximately 83.9% of caretaker respondents revealed that they and the members of their households had experienced periods of food insecurity in the 12 months prior to the interview. Of the 83.9%, 29.6% experienced household food insecurity; 19.3% of mothers whose responses to the Radimer/Cornell scale indicated individual food insecurity and 35.0% fell into the child hunger category. Compared to food-insecure households, food-secure households had significantly higher total food expenditures ($p<0.05$), which include expenditures on fruits and vegetables ($p = 0.011$), animal-source food ($p = 0.028$) and milk and dairy products ($p = 0.047$). Furthermore, compared to their counterparts in the food-secure group, mothers from food-insecure households had lower diet diversity scores on grain and cereals, meat and meat products, fish and seafood, fruits, vegetables, milk and dairy products and beverages. Multinomial logistic regression revealed that total food expenditure (OR = 0.99; 95% C.I, 0.99, 1.00; $p<0.05$) and total diet diversity score (OR = 0.63; 95% CI, 0.54, 0.75; $p<0.001$) were found to be associated with household food insecurity after controlling for potential confounder. The prevalence of household food insecurity has reached a high and alarming scale. Inadequate dietary intake is usually observed in low-income households as direct or indirect consequences of household food insecurity.

Key words: Household food insecurity, food expenditure, diet diversity

INTRODUCTION

Food insecurity includes problems with the quantity and quality of available food, uncertainty of food supply and food insecurity experiences, which include running out of food and purchasing power to buy food, skipping meals and hunger due to financial constraints (Emmons, 1986; Kendall *et al*., 1996). Food availability and access is restricted due to high food prices and limited resources, which result in inadequate quantity and poor quality of diet in households. This problem started with the decreasing and infrequent consumption of expensive food items. Mothers within families would compromise their own nutrient needs to protect their children from food insufficiency as much as possible (Brinkman *et al*., 2010). Therefore, total food expenditure as well as expenditures on certain expensive food groups decline with increasing food insufficiency. Expensive food groups, which include higher-quality animal-source food, such as, meat, poultry, eggs, fish and milk, fruits and vegetables, are also reduced (Dachner *et al*., 2010). When this coping strategy becomes inadequate, households may also try to reduce expenditure on basic foods, such as sugar, oil, salt and other staple food. Hence, aside from macronutrient, the intake of specific micronutrients is reduced, which eventually leads to the high prevalence and severity of micronutrient deficiencies (Bloem *et al*., 2005). Poor dietary quality or diversity is a significant contributing factor of undernutrition, specifically micronutrient deficiencies (Steyn *et al*., 2006). This condition is usually observed in children from low-income households as a direct or indirect consequence of household food insecurity (Baer

Corresponding Author: A.J. Rohana, Department of Community Medicine, School of Medical Sciences, Health Campus, Universiti Sains Malaysia Kubang Kerian, 16150 Kelantan, Malaysia

and Madrigal, 1993; Kennedy and Peters, 1992). The Radimer/Cornell hunger and food insecurity instrument, which maintains that food insecurity is a managed process, identifies household food insecurities at the individual and child levels (Radimer *et al*., 1990). Although the Radimer/Cornell instrument has been used extensively in the United States, its application in a different cultural setting is relatively limited (Kaiser *et al*., 2002; Studdert *et al*., 2001). The Radimer/Cornell instrument has been shown to be applicable in Malaysia for the direct assessment of household food insecurity (Zalilah and Khor, 2008; 2004; Zalilah and Merlin, 2001). The state of Kelantan has recorded the highest prevalence (77.5%) of household food insecurity (Sulaiman *et al*., 2011) compared to other states in Malaysia (Zalilah and Khor, 2004; Zalilah and Merlin, 2001). The main objective of this study is to identify the association of food expenditure and diet diversity with food insecurity status in low-income households in the rural areas of East Coast, Peninsular Malaysia.

MATERIALS AND METHODS

Study location: The study was concentrated on Bachok district. The area is located 25 kilometers east of Kota Bharu, the capital city of Kelantan state, which had the lowest mean monthly income (RM 1,829) in all states in Malaysia in 2004. Kelantan is categorized as a less developed state due to the high incidence of poverty (10.6%) (Ninth Malaysia Plan, 2006). Bachok district was chosen for the study because it represents a typical rural Malaysian district in terms of literacy and the distribution of rural and peri-urban areas and government health facilities.

Study population: A cross-sectional survey on households receiving monthly allowance was conducted. Two hundred twenty-three households of mothers aged 18 to 55 years old with at least one child in the 2 to 12 years range were purposively selected. Mothers were recruited because they are responsible for food production, acquisition and preparation and they are the key persons for household food security (Hindin, 2006; Kotze, 2003).There are 12 villages in Bachok district, with the Malay ethnic group as the majority population. Eight of the largest villages were selected based on population density. Given the strict inclusion criteria, probability sampling was not conducted and all the respondents were purposively selected from the records of the Welfare Department until the calculated sample size (n = 223) was reached.

Data collection: Prior to data collection, permission to carry out the study was obtained from the Social Welfare Department of Malaysia and from the Medical Ethics Committee, Universiti Sains Malaysia (1001/PPSK/ 812022). The subjects who participated in this study also signed a consent form. Data collection was conducted from November 2009 to June 2011. Lists of welfare allowance recipients were provided by the welfare office and the village head. Two trained research assistants gathered information from the participants. The respondents were interviewed using a structured questionnaire to obtain information on their demographic and socioeconomic characteristics, household food security, food expenditure and diet diversity.

Measurement

Household food insecurity: Food insecurity was assessed at the household level with the 10-item Radimer/Cornell hunger scale (Kendall *et al*., 1995; Radimer *et al*., 1992), which was translated to Malay and subsequently validated (Zalilah and Merlin, 2001). Food insecurity construct consists of four components: quantity of food, quality of food, food acceptability and certainty of obtaining food. According to the conceptualization of the Radimer/Cornell scale, when the problem worsens, uncertainty and anxiety about food at the household level is experienced first (mild food insecurity), followed by adult food insecurity (or moderate food insecurity) characterized by a decrease in the quality and quantity of food consumed by adults (Kendall *et al*., 1996). Child hunger (or severe food insecurity) is the most severe problem in household food security and is characterized by a decrease in the quantity of food consumed by children. Based on the data of the Radimer/Cornell scale obtained from the mothers, children were classified into four mutually exclusive categories: food secure, household food insecure, adult food insecure and child hunger as suggested by Kendall *et al*. (1996).

Food expenditure: Each household was asked to report expenditures (on cereals and grains, fruits and vegetables, meat and meat products, fish, eggs, milk and dairy products, snacks and beverages, cooking oil, sugars, away-from-home food and other foods) from the previous 30 days.

Diet diversity: The Food Frequency Questionnaire (FFQ) was used to record all the usual dietary intake of the mother. The FFQ consisted of 30 food items common to rural Malaysians. These food items represent eight major groups of cereals and cereal products, meat and meat products, fish, fruits, vegetables, legumes, milk and dairy products and beverages. A score of 1 is given if the food group is consumed daily or at least twice a week and 0 for other responses. The possible score range is 0 to 30, with a higher score indicating a more diverse diet.

Data analysis: Data were entered and analyzed using PASW Windows Version 18.0. Women who reported household and individual food insecurity as well as child hunger were categorized as food insecure. The

qualitative data were represented in the form of proportions (%) and the quantitative information in the form of means with standard deviations. The difference in the mean diet diversity and food expenditure between food-secure households and food-insecure households was examined using the Independent T test. Multivariate logistic regression was performed to identify the association between food expenditure and diet diversity and food insecurity status after adjusting for potential confounders. Significance level was set at $p<0.05$.

RESULTS

Table 1 summarizes the data on the socio-economic characteristics of the respondents. The mean age of the mothers was 42.20 years (6.42). Majority of the mothers (49.3%) attained lower secondary education and only 8.1% of the mothers hold technical and vocational certificates; 22.0% of the mothers have low educational level and half of them never received formal schooling. The average household size of 6.71 members (2.29) was higher than the average household size of 4.6 members reported for households in the rural areas of Malaysia (Malaysia Population and Family Survey, 1994 and 2004). Sixty percent of the total households were single-headed families, with the mother either widowed or divorced comprising 38.1% and 21.5% of the population, respectively. Meanwhile, double-headed households comprised 40.4% of the respondents. Among the respondents surveyed, 67.8% had full-time jobs, whereas the rest (32.2%) were housewives. Data on the economic characteristics of the households (Table 1) showed that the mean monthly household income is RM 815.77 (365.67) [US$ 260 (116.08)] per month, which indicates that 44.4% earn below the poverty line [(RM 691; US$ 219.36)]. Up to 33.6% have a total income ranging from RM 691 to RM 1,000 [US$ 219.36 to US$ 317.46)], whereas 22.0% exceeded RM 1,000 per month. The household per capita income

Table 1: Households socio-economic and demographic characteristics

Variables	Frequency (%)	Mean (SD)
Age of mothers (years)		42.24 (6.42)
Education of the mother		
No schooling	24 (10.8)	
Primary	25 (11.2)	
Lower Secondary	110 (49.3)	
Higher Secondary	46 (20.6)	
Others	18 (8.1)	
Household size		6.71 (2.29)
No. of children per household		5.14 (2.487)
No. of children going to school		3.05 (1.518)
Marital status of mother		
Married	90 (40.4)	
Widow	85 (38.1)	
Divorced	48 (21.5)	
Employment status		
Working women	151 (67.7)	
Housewife	72 (32.2)	
Food security status		
Household food secure	36 (16.1)	
Household food insecure	66 (29.6)	
Individual insecure	43 (19.3)	
Child hunger	78 (35.0)	
Household income RM		815.77 (365.67)
<RM691[A]	99 (44.4)	
691-1000	75 (33.6)	
>RM 1000	49 (22.0)	
House hold income per capita RM		130.66 (62.15)
<59[B]	10 (4.5)	
59-118.04[C]	105 (47.1)	
>119.04	108 (48.4)	
No. of participants in household income		1.29 (0.67)
None	14 (6.3)	
Only one	143 (64.1)	
More than one	66 (29.6)	
Total food expenditure RM		476.46 (206.15)
Less than RM 250	25 (11.2)	
RM 250-499	109 (48.9)	
RM-500-750	69 (30.9)	
More than RM 750	20 (9.0)	

[A]Household poverty line income; [B]Hard core poor; [C]Poor (Malaysia and Economic Planning Unit (EPU, 2007)

average used in the sample is RM 130.66 (62.15) [US$ 41.49 (19.72)]. Using RM 118.04 (US$ 37.47) as the poverty level of per capita income in Malaysia (EPU, 2007) indicates that approximately 51.4% of the households in this study are living in poverty. The average food expenditure is RM 476.46 (206.15). Up to 11.2% of the households spend less than RM 250, whereas 50% of the households spend RM 250 to RM 499 on food and only 9.0% spend more than RM 750.

Households were classified into one of the four food insecurity categories using the Radimer/Cornell measures. Thirty-six households (16.1%) were classified as food secure. Sixty-six households (29.6%) were found to be experiencing the least severe level of food insecurity, which were classified as "household insecure." These households ran out of food, were uncertain about their ability to obtain sufficient food and were beginning to compromise the quality of the family diet. Another 43 households (19.3%) had adults who were experiencing food insecurity and 78 households (35%) had hungry children in them. This finding means that parents decide the small quantity and poor quality of food consumed by their children. As such, the children end up asking for more food. This condition is the most severe level of food insecurity (Table 1). The Radimer / Cornell scale showed acceptable internal consistency (Cronbach's alpha = 0.88).

Table 2 presents the household food expenditure. Compared to the total food expenditure between food-secure and food-insecure households, food-secure households spend more on buying and preparing food than the food insecure; the difference is significant (p = 0.019). The results suggest a significant difference in food expenditure on fruits (p = 0.011), animal-based food (p = 0.028) and milk and dairy products (p = 0.047). On the other hand, the differences in food expenditures on cereals and grains, fat, oils, sugar and salt, snacks were not significant.

The mean dietary diversity scores of food groups according to food security status are presented in Table 4. In general, the mean dietary diversity score for respondents from food-secure households is 12.69 (3.26), which was significantly higher than among the food-insecure respondents at 8.87 (221) (p<0.001). The mean number of servings of grain and cereals, meat and meat products, fish and seafood, fruits, vegetables, milk and dairy product and beverages for respondents from food-secure households was significantly higher than in the food-insecure households.

Food expenditure (OR = 0.99; 95% C.I, 0.99, 1.00; p<0.05) and diet diversity score (OR = 0.63; 95% CI, 0.54, 0.75; p<0.001) were negatively associated with food insecurity status, when the scores were adjusted according to the educational level of the mother, household size and total income (Table 4). The odd ratio of food expenditure indicates that the decrease in food expenditure by one Malaysian Ringgit is associated with a 1% increase in the odd ratio of food insecurity. Decrease in the odd ratio of diet diversity score by one unit is associated with a 37% increase in the odd ratio of food insecurity status.

Table 2: Food expenditure (RM) for food secure and food insecure households (n = 223)

	Food secure (n = 36)	Food insecure (n = 187)			
Variables	Mean (SD)	Mean (SD)	t-stat (df)	Mean Difference (95% CI)	p-value[a]
Cereals and grains	104.85 (74.31)	90.48 (46.59)	1.11 (40.45)	14.37 (-11.58, 40.32)	0.270
Fruits and vegetables	58.23 (48.95)	41.14 (34.05)	2.55 (221)	6.70 (3.88, 30.30)	0.011
Animal based food	230.30 (146.52)	190.82 (86.33)	2.20 (221)	17.9 (4.198, 74.75)	0.028
Milk and dairy products	23.65 (32.682)	15.17 (21.0)	2.00 (221)	8.48 (0.13, 16.83)	0.047
Fat, oil, sugar and salt	28.54 (26.04)	22.81 (18.48)	1.26 (42.04)	5.72 (-3.44, 14.89)	0.115
Snacks and beverages	56.27 (43.612)	67.11 (61.780)	-1.00 (221)	10.8 (-32.10, 10.42)	0.316
Away from home food	58.40 (73.84)	37.78 (67.481)	1.65 (221)	20.61 (-3.96, 45.19)	0.100
Total food expenditure	550.05 (257.69)	462.28 (192.29)	2.36 (221)	87.76(14.57, 160.96)	0.019

[a]Significant level at 0.05

Table 3: Diet diversity score of food secure and food insecure households

		Food secure	Food insecure			
Food groups	Range	Mean (SD)	Mean (SD)	t-stat (df)	Mean difference (95% CI)	p-value
Grain and cereals	1-5	2.69 (0.85)	2.11 (1.04)	3.18 (221)	0.58 (0.22, 0.95)	0.002
Meat and meat product	0-3	1.30 (0.66)	0.41 (0.65)	7.49 (221)	0.89 (0.65, 1.12)	<0.001
Fish and sea foods	0-3	1.58 (0.60)	1.36 (0.57)	2.01 (221)	0.21 (0.01, 0.42)	0.043
Fruits	0-5	1.58 (1.33)	0.47 (0.77)	6.86 (39.5)	1.10 (0.78, 1.42)	<0.001
Vegetables	0-5	2.63 (1.43)	1.59 (1.53)	3.76 (221)	1.04 (0.49, 1.59)	<0.001
Legumes and nuts	0-1	0.11 (0.31)	0.06 (0.24)	0.99 (221)	0.04 (-0.04, 0.13)	0.320
Milk and dairy products	0-3	1.05 (0.67)	0.55 (0.57)	4.61 (44.45)	0.49 (0.28, 0.71)	<0.001
Beverages	0-2	1.50 (0.56)	1.16 (0.51)	3.49 (47.1)	0.33 (0.14, 0.52)	0.002
Diet diversity final score	2-20	12.69 (3.26)	7.63 (3.11)	8.87 (221)	5.06 (3.94, 6.19)	<0.001

Table 4: Odd ratio of food expenditure and diet diversity score

Variables	B	Crude OR (95% CI)	p-value	B	Adjusted OR (95% CI)*	p-value
Food expenditure	-0.002	0.99 (0.99, 1.00)	0.024	-0.002	0.99 (0.99, 1.00)	0.049
Diet diversity score	-0.438	0.64 (0.56, 0.74)	0.000	-0.449	0.63 (0.54, 0.75)	0.000

*Adjusted for educational level of the mother, Household size and total income

DISCUSSION

This study found a higher prevalence of food insecurity in low-income households compared to other studies conducted in Malaysia (Zalilah and Khor, 2004; Zalilah and Merlin, 2001). This difference could be due to the higher rate of poor households in this sample, which was substantially higher (44.4%) than in Malaysia (5.7%) and Kelantan (10.6%) based on the poverty line income (Ninth Malaysia Plan, 2006). The result of this research was consistent with previous studies (77.5%) conducted in the neighboring district of Tumpat (Sulaiman *et al*., 2011). The prevalence of child hunger was higher than the prevalence of individual food hunger. In contrast, a US study reported a reverse phenomenon, in which the prevalence of individual food insecurity (17%) was higher than the prevalence of child hunger (11%) (Kendall *et al*., 1996). This finding can be attributed to the fact that mothers would compromise their own nutrient needs to protect their children from becoming food insecure as much as possible. Thus, responding to questions relevant to child hunger is easy for the mothers. Studies on the relationship between child food insecurity and expenditure revealed that the consumption of fruits and vegetables, animal-based food and dairy product was higher among food-secure children than children from food-insecure households. The findings of the present study were consistent with Chee's finding that the overall qualitative assessment of the dietary pattern showed a low consumption of poultry, meat and dairy products (Chee *et al*., 1996). The reduction in meat consumption among food-insecure children was observed in poor, urban children in Seoul, South Korea (Oh and Hong, 2003). The possible reason for this phenomenon was the higher prices of animal-based food and the limited purchasing power of low-income of households. The low socio-demographic factors reflected on the family life conditions lead to lesser family income and limited options in food purchases, especially in high quality or expensive items, such as animal-based food, fruits, vegetables and dairy products.

Diet diversity is used as a proxy for food insecurity (Hoddinott and Yohannes, 2002). The mean diet diversity score of the eight food groups (except legumes and nuts) in food-secure households was significantly higher than its counterparts in food-insecure households. Several studies have reported that food-insecure households have lower dietary diversity scores (Champagne *et al*., 2007; Hoddinott, 2002) and lower number of servings of food groups, such as meat, fish, poultry, legumes (Nnakwe, 2008), milk and dairy products (Tarasuk *et al*., 2007), fruits and vegetables and bread and cereals (Nnakwe, 2008). The poor diet quality among food-insecure households could be attributed to the lack of availability and accessibility of food, or the cultural practices and beliefs that limit food choices.

No dropouts or drawbacks were reported throughout the study period. The sample size was small and restricted to subjects who receive a monthly welfare allowance. As such, the records of the Welfare department may have under-represented the poor families in Bachok District for various reasons. Conversely, some of the families included in these records have generated new incomes, which brought them out of the poverty circle. Despite these limitations, food insecurity may represent an appreciable problem in low-income rural households in Malaysia. The prevalence of food insecurity was consistent with previous studies on household food insecurity for a similar population in the neighboring district of Tupmat (Sulaiman *et al*., 2011).

Conclusion: The prevalence of household food insecurity in the study location was high and alarming. Although the dietary patterns of both levels of household food insecurity showed low consumption of expensive foods, the dietary behavior of a food-secure household was better than that of a food-insecure household. Furthermore, indicated that subjects from food-insecure households, or those who were unable to afford to eat a balanced diet, were less likely to consume fruits and vegetables or animal-source foods frequently. Inadequate dietary intake is usually seen in low-income households as a direct or indirect consequence of household food insecurity.

Authors' contributions: Ihab A.N contributed to the data collection, data entry and data analysis and wrote the manuscript. Wan Manan W.M. was the primary investigator for the wellness assessment of household food insecurity and nutritional outcomes among social welfare recipients in Bachok, Kelantan. Wan Manan W.M. was also responsible for the application of grant, budget and ethical approval. Rohana A.J. contributed to the design of the study, contacted the authorities involved in the study, supervised the fieldwork data collection and wrote the initial draft manuscript. As a trained research assistant, Wan Suriati W.N. was totally involved in the data collection and in managing technical problems in the fieldwork. Zalilah M.S. and Mohamed Rusli A.

advised and participated in the design of the study. All authors participated in the reading, review and approval of the final manuscript.

ACKNOWLEDGMENTS

This work was supported by a university research grant No. 1001/PPSK/812022 from the Universiti Sains Malaysia. The authors would like to express their gratitude and appreciation to all the participants and staff and to Miss Fiona Lim Wei Ting and Mr. Azizi bin Mohamed Zain, who assisted in this study. Profound appreciation is extended to the Social Welfare Department of Malaysia for giving permission to conduct the study. The authors would also like to thank the statistician, Dr. Kamarul Imran, for his help and guidance in data analysis.

Competing interests: The authors declare that they have no competing interests.

REFERENCES

Baer, R.D. and L. Madrigal, 1993. Intrahousehold allocation of resources in larger and smaller Mexican households. Soc. Sci. Med., 36: 305-310.

Bloem, M.W., S. de Pee and I. Darnton-Hill, 2005. Micronutrient deficiencies and maternal thinness. First chain in the sequence of nutritional and health events in economic crises. Primary and Secondary Preventive Nutrition; Humana Press; 2005, pp: 689-709.

Brinkman, H.-J., S. de Pee, I. Sanogo, L. Subran and M.W. Bloem, 2010. High food prices and the global financial crisis have reduced access to nutritious food and worsened nutritional status and health. J. Nutr., 140: 153S-161.

Champagne, C.M., P.H. Casey, C.L. Connell, J.E. Stuff, J.M. Gossett, D.W. Harsha, B. McCabe-Sellers, J.M. Robbins, P.M. Simpson and J.L. Weber, 2007. Poverty and food intake in rural America: Diet quality is lower in food insecure adults in the Mississippi Delta. J. Am. Diet. Assoc., 107: 1886-1894.

Chee, S., H. Zawiah, M.N. Ismail and K.K. Ng, 1996. Anthropometry, dietary patterns and nutrient intakes of Malaysian estate workers. Mal. J. Nutr., 2: 112-126.

Dachner, N., L. Ricciuto, S.I. Kirkpatrick and V. Tarasuk, 2010. Food purchasing and food insecurity among low-income families in Toronto. Can. J. Diet. Pract. Res., 71: 50-56.

Emmons, L., 1986. Food procurement and the nutritional adequacy of diets in low-income families. J. Am. Diet. Assoc., 86: 1684-1693.

EPU, 2007. Economic Planning Unit, Malaysia Measuring and monitoring poverty and inequality. Prime Ministers Department.

Hindin, M.J., 2006. Women's input into household decisions and their nutritional status in three resource-constrained settings. Public Health Nutr., 9: 485-493.

Hoddinott, J., 2002. Methods for rural development projects, International Food Policy Research Institute, Washington, DC.

Hoddinott, J. and Y. Yohannes, 2002. Dietary Diversity as a Food Security Indicator. Food Consumption and Nutrition Division Discussion Paper 136. International Food Policy Research Institute, Washington, DC.

Kaiser, L., H. Melgar-Quinonez, C. Lamp, M. Johns, J. Sutherlin and J. Harwood, 2002. Food security and nutritional outcomes of preschool-age Mexican-American children. J. Am. Diet. Assoc., 102: 924-929.

Kendall, A., C.M. Olson and E.A. Frongillo, 1996. Relationship of hunger and food insecurity to food availability and consumption. J. Am. Diet. Assoc., 96: 1019-1024.

Kendall, A., C.M. Olson and E.A. Frongillo Jr., 1995. Validation of the Radimer/Cornell measures of hunger and food insecurity. J. Nutr., 125: 2793-2801.

Kennedy, E. and P. Peters, 1992. Household food security and child nutrition: The interaction of income and gender of household head. World Development, 20: 1077-1085.

Kotze, D.A., 2003. Role of women in the household economy, food production and food security: Policy guidelines. Outlook Agric., 32: 111-121.

National Population and Family Development Board, 2004. Malaysian Population and Family Survey 1994 - 2004. Kuala Lampur, Malaysia.

Ninth Malaysia Plan (2006-2010), 2006. Economic Planning Unit (EPU). Putrajaya, Malaysia: Malaysian National Printing.

Nnakwe, N.E., 2008. Dietary patterns and prevalence of food insecurity among low-income families participating in community food assistance programs in a Midwest Town. Family Consumer Sci. Res. J., 36: 229-242.

Oh, S.Y. and M.J. Hong, 2003. Food insecurity is associated with dietary intake and body size of Korean children from low-income families in urban areas. Eur. J. Clin. Nutr., 57: 1598-1604.

Radimer, K., C. Olson and C. Campbell, 1990. Development of indicators to assess hunger. J. Nutr., 120(11 Suppl): 1544-1548.

Radimer, K., C. Olson, J. Greene, C. Campbell and J. Habicht, 1992. Understanding hunger and developing indicators to assess it in women and children. J. Nutr. Educ., 24(1 Suppl): 36-44.

Steyn, N., J. Nel, G. Nantel, G. Kennedy and D. Labadarios, 2006. Food variety and dietary diversity scores in children: Are they good indicators of dietary adequacy? Public Health Nutr., 9: 644-650.

Studdert, L.J., E.A. Frongillo and P. Valois, 2001. Household food insecurity was prevalent in Java during Indonesia's economic crisis. J. Nutr., 131: 2685-2691.

Sulaiman, N., Z.M. Shariff, R.A. Jalil, M.N.M. Taib, M. Kandiah and A.A. Samah, 2011. Validation of the Malaysian Coping Strategy Instrument to measure household food insecurity in Kelantan, Malaysia. Food Nutr. Bull., 32: 354-364.

Tarasuk, V., L. McIntyre and J. Li, 2007. Low-income women's dietary intakes are sensitive to the depletion of household resources in one month. J. Nutr., 137: 1980-1987.

Zalilah, S. and G. Khor, 2008. Household food insecurity and coping strategies in a poor rural community in Malaysia. NRP, 2: 26-34.

Zalilah, S. and L.K. Khor, 2004. Indicators and nutritional outcomes of household food insecurity among a sample of rural Malaysian women. Pak. J. Nutr., 3: 50-55.

Zalilah, S. and A. Merlin, 2001. Assessment of food insecurity among low income households in Kuala Lumpur using the Radimer/Cornell food insecurity instrument-a validation study. Mal. J. Nutr., 7: 15-32.