SOCIO-ECONOMIC STATUS AND FOOD INSECURITY AMONG THE ELDERLY IN PANJI DISTRICT, KOTA BHARU, KELANTAN, MALAYSIA

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Abstract

Food insecurity is a common problem among the low-income households in the developing countries including Malaysia. This study was to assess the prevalence of food insecurity and identify the risk factor of food insecurity among elderly in Panji District, Kota Bharu, Kelantan, Malaysia. Face-to-face interview was done among 227 elderly aged 60 and above to obtain their information on demographic and socio-economic background, and food security status. For analysis of data, descriptive statistics, chi-square, ANOVA and logistic regression were used. The findings indicated that 22.9% of the elderly were food insecure which comprised of 15.4% low food secure, and 7.5% were very low food secure. There were significant differences between food security status with personal income of elderly, household size, marital status, educational level, and age ($p < 0.05$). There was a significant decrease in the mean income as food security status worsened ($p < 0.05$). Household size more than five members and income less than RM1000 were more likely to become food insecure. Food insecurity in the elderly is worse than in other populations. Future intervention and assistance program should focuses more on economic status among the elderly to reduce the risk of food insecure.

Keywords: elderly, food insecure, demographic, socio-economic

Introduction

Food security as defined by The World Food Summit (1996) is "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life". Commonly, the concept of food security was defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. Meanwhile, food insecurity exists when people do not have access, at all times, to enough nutritious food to support an active and healthy life (Coleman-Jensen & Nord, 2013).

According to Veterans Aging Cohort Study 2002–2008, 24% of veterans reported food insecurity in United States (Wang et al., 2015). Meanwhile in Malaysia, there was no reported national prevalence of food insecurity among elderly. However, there was a study among women in Kelantan by Norhasmah et al. (2011) reported that in rural areas, 35.1% were moderately food insecure and 42.4% were severely food insecure, as compared with 26.0% and 32.7% in urban areas. Therefore, food insecurity is a phenomenon that occurs not only in developing countries but also in developed countries and it is recognized as a major public health concern (Norhasmah et al., 2010). Some researchers have shown that there is an association between socio-economic status and household food insecurity. According to Nord et al. (2009), poor households had three times more probability than other households for food insecurity. In addition, Zalilah and Khor (2008) conducted a study among low-income rural communities revealed that most of the food insecure households live below the poverty line (59.5%), with 7.8% classified as households that are hard-core poor.

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Economic Planning Unit (EPU) reported that by the year of 2012, the incidence rates of poverty were high in rural compared to urban area with 3.4% and 1%, respectively (Economic Planning Unit, 2013). This showed a clear view regarding poverty rate that are existing in the community which might influence the unavailability of an individual to get enough and nutritious food. Thus, the objective of this research is to assess the prevalence of food insecurity and identify the socio-economic characteristics such as household size, age, educational level, and personal income contributing to food insecurity among elderly in Panji District, Kota Bharu, Kelantan.

Literature Review

Poverty is one of the factors for food insecurity since the food-insecure individuals tend to have lower quantity and quality food intake. In many studies, low income has consistently been shown to be a contributing factor of food insecurity (Olson et al., 1997). Poverty is the core factor of food insecurity and the lack of money prevent the purchase of food.

Low income factor

According to Coleman-Jensen et al. (2013), being food insecure is more common among those in low-income individuals. Zalilah and Tham (2002) revealed that income is the most important determinant of household food insecurity. A study done by Ihab et al. (2012) among low income women in Kelantan found that 83.9% of women were food insecure at certain level. According to Grosvenor and Smolin, (2002) there are economic changes common in older adults that increase the risk of food insecurity. The risk factors for financial difficulty in acquiring food were conceptualized within a framework of food insecurity specific to the elderly that considers relations to income, medical costs, nutritional services, poor health, and psychological and social characteristics (Wolfe et al., 1996). Furthermore, it was reported that the number of people suffering from chronic hunger increased from below 800 million in 1996 to above 1 billion in 2009 all over the world (Vermeulen et al., 2012).

Household size factor

Besides that, Zalilah and Khor, (2008) revealed that the larger household size were more likely to be food insecure. This is because, the household expenditure will increase due to daily expenses and more mouths to feed. Olayemi (2012) mentioned that the larger household size, the lesser food availability to each person within the household. Increasing in household size will decrease per capita food intake. Everyone should ensure that all family members can be fed if they have a large household.

Marital status factor

Little is known about the association between marital status and food insecurity. Being married profoundly enhances family income and wealth (Zagorsky, 2005). Conversely, separation and divorce have negative economic consequences that can affect the food intake (Zagorsky, 2005). Marriage also provides social support and other noneconomic resources that help individuals withstand periods of economic uncertainty or stress (Hanson et al., 2007).

Educational level factor

According to Duerr, (2007), high school graduates had much higher food security rate rather than those without a high school education. Ben-Davies et al. (2014) has found that level of parental education was independently associated with moderate and severe food insecurity. Other study by Olayemi (2012) reported that the increasing year of formal education will decrease the household food insecurity. Furthermore, the increasing years of schooling are associated with better employment opportunities, working efficiency, better decision making and increased income (Bashir & Schilizzi, 2013; Gezimu Gebre, 2012).

Age factor

Wang et al. (2015), reported 24% of veterans in United States were having food insecurity. A veteran refers to a person who has had long experience in a particular field. The study conducted in Nigeria by Oluwatayo (2008) found out that age also has a positive influence on food security.

Methods

Kelantan is one of the 14 states in Malaysia. This study was carried out in the territory of Kota Bharu. Kota Bharu is a state capital and royal seat of Kelantan. It is one of the territories (*Jajahan*) in Kelantan besides the other territories such as territory of Tumpat, Pasir Mas, Tanah Merah, Jeli, Kuala Krai, Machang, Pasir Putih, Bachok, and Gua Musang. Kota Bharu is situated in the northeastern part of Peninsular Malaysia, and lies near the mouth of the Kelantan River. There are 15 districts in Kota Bharu (Table 1). Panji is one of its districts. Panji has the highest population of elderly (8,209) among others districts in Kota Bharu (Department of Statistics, 2010). Basically, there are twelve *mukim* in Panji District. From the twelve *mukim,* Mukim Padang Bongor was selected based on simple random sampling. There are only two villages (Kampung Padang Bongor and Kampung Paya Bemban) under Mukim Padang Bongor and both villages were found involved in this study. Thetotal elderly in Kampung Padang Bongor and Kampung Paya Bemban were 168 and 122, respectively. However, 134 elderly from Kampung Padang Bongor and 93 elderly from Kampung Paya Bemban who are Malaysians, non-institutionalized, do not have any hearing problem, without any critical illness and free from severe mental problem were invited to participate in this study.

Table 1: Districts in Kota Bharu

Districts	Number of Elderly
Badang	4092
Banggu	2883
Beta	1668
Kadok	2761
Kemumin	3363

Kota	3694
Limbat	2166
Kubang Kerian (Lundang)	6529
Ketereh	4547
Panji	**8209**
Pendek	2395
Peringat	3282
Salor	1936
Jering	2967
Kota Bharu	6997

* Department of Statistics, Malaysia (2010).

Instruments

Respondents were face-to-face interviewed on their demographic, socio-economic background and food security status. Detailed information on marital status, living arrangement, house status, household size, number of schooling children, educational level, occupation status, and personal income were obtain. Meanwhile, food security status was assessed by the U.S.Household Food Security Survey Module 2012 (Six Item Short Form) (Blumberg et al., 1999). There are six questions in this module and can be categorized into three level of food security status namely high or marginal food security, low food security and very low food security. A few questions consist of four responses such as 'often true','sometimes true','never true', or 'don't know'. Meanwhile, certain questions consist of three responses such as 'yes','no' or 'don't know' . Those who response 'often true', 'sometimes true' and 'yes' will be given one score and those who response 'never true', 'don't know' and 'no' will be given zero score. The total score for this module is six. The indicators for each score and level of food security status as in Table 2.

Table 2: Food Security Status

Total score	Food security status
0 to 1	High or marginal food security
2 to 4	Low food security
5 to 6	Very low food security

Data analysis

The data was analyzed using SPSS Statistics version 21. Descriptive data in the form of percentages, frequency, mean, and standard deviation have been used to describe all the variables such as demographic and socio-economic background, and prevalence of food security status of respondents. One-way analysis of variance

(ANOVA) and Post-hoc Bonferroni test was used to determine the significant differences between continuous variables with food security status. Meanwhile, chi-square test was used to determine the significant differences among food security status with categorical variables. All the statistical significance were set as $p<0.05$. Logistic regression was used for determining factors associated with food security status. The results of logistic regressions were expressed as adjusted odds ratios (ORs), with 95% confidence intervals (CI). The odds ratio greater than 1.00 is a risk factor for food insecurity among elderly.

Results

Demographic and socio-economic background

Table 3 shows the demographic and socio-economic characteristics of respondents. There were a total of 227 elderly aged 60 years old and above with the mean age of 67.30±6.56 years old involved in this study. About 61.7% of respondents were female, while 38.3% were male. All the respondents were Malay (100%) with 73.6% were married and 26.4% were widow or widower. In terms of the living arrangement, 6.6% of respondents were living alone and 93.4% of respondents were living with others. Almost all the respondents (98.2%) have their own home and only 1.3% rent house for their house status. The mean household size of the respondents was 4.07±2.07 with 77.5% consists of one to five members and 22.5% consists of six to 10 members. Meanwhile for number of schooling children, 78.9% of respondents do not have schooling children and 21.1% have schooling children with maximum of three.

For educational level, the total years of schooling for respondents were 4.90±4.11. The years of schooling for respondents started from standard one to tertiary education. About 44.1% of respondents attained education level until primary school, 26.4% were until secondary school, 0.9% attained education level until tertiary education and 28.6% did not attend any formal education. About 60.8% of respondents were unemployed or housewives. The mean for personal income of the respondents was RM973.48±RM786.82 with 55.5% of the respondents were having income less than RM1,000 per month, and 44.5% of the respondents were having income RM1,000 and above per month. The cut-off point of that income was according to *Perintah Gaji Minimum* (PGM), 2016. *Perintah Gaji Minimum* (PGM) here refers to the minimum wage to be given to employees.

Table 3: Demographic and Socio-economic Background of Respondents (n=227)

Characteristics	N	(%)	Mean±SD	Min - Max
Age (Years)			**67.30±6.56**	**60 - 98**
60 – 69	162	71.4		
70 – 79	52	22.9		
80 – 89	11	4.8		
≥ 90	2	0.9		

Sex

Male	87	38.3
Female	140	61.7

Ethnicity

Malay	227	100

Characteristics	N	(%)	Mean±SD	Min - Max
Marital status				
Married	167	73.6		
Widow/Widower	60	26.4		
Living arrangement				
Living alone	15	6.6		
Living with others	212	93.4		
Partner	44	20.8		
Partner, children, and grandchildren	133	62.7		
Parents, children, and grandchildren	34	16.0		
Others (cousin)	1	0.4		
House status				
Owned	223	98.2		
Rent	3	1.3		
Others	1	0.4		
Household size				
1 – 5	176	77.5	4.07±2.07	1 – 10
6 – 10	51	22.5		
Personal Income (RM)*				
< RM1000	126	55.5	973.48±786	100–4000
≥ RM1000	101	44.5	82	

* Perintah Gaji Minimum Malaysia, 2016.

Food security status

Table 4 illustrates the prevalence of food insecurity among the respondents. About 77.1% of the respondents were reported to have fully or marginal food secure. Meanwhile, 22.9% of respondents were reported to have food insecurity with 15.4%

were low food secure and 7.5% were very low food secure. This is quite similar to the data from the Veteran Aging Cohort Study (2015), United States that reported 24% of the elderly were food insecure. Besides that, the prevalence of food insecurity from a variety of domestic studies in the United States, including among older adults were from 5% to 40% reflecting differences in measurement and sampling (Quandt et al., 2001). According to Department of Agriculture's Food Security Survey (2008) in the United States, 15.2% of veterans reported food insecurity compared with 16.8% of general population (Nord et al., 2009). Meanwhile, the prevalence of food insecurity among cohort of older Australian was 13% (Russell et al., 2014). Furthermore in Malaysia, a study by Muhammad Adib Aiman and Norhasmah (2013) reported that about 43% of Malay elderly in Tanjung Malim Perak were food insecure. The prevalence of food insecurity was higher compared to this study of food insecurity. This is due to the lower income among the elderly. The mean income for elderly in Tanjung Malim, Perak was lower (RM656.75±743.93) compared to elderly in Panji District, Kota Bharu, Kelantan (RM973.48±RM786.82).

Table 4: Prevalence of Food Insecurity among the Respondents (n=227)

Food Security Status	n	Percentages (%)
Fully or marginal food secure	175	77.1
Low food secure	35	15.4
Very low food secure	17	7.5

Demographic and Socio-economics Characteristics based on Food Security Status of the Respondents

Table 5 show the demographic and socio-economics characteristics based on food security status of the respondents. The inncome level was included in the main risk factor towards the food insecurity. In this study, the personal income was significantly different with the food security status. By using the post-hoc test, the mean monthly income of fully or marginal food security (RM 1109.03±834.30) was significantly higher compared to the low food secure (RM 492.86±309.92), and very low food secure (RM 567.65±299.45) of the respondents. Several studies in developing and developed countries found income as one of the core determinant of food insecurity (Susilowati & Kayadi, 2002; Bhattacharya et al, 2004; Olson et al, 1996). Inadequate income can contribute to inability to provide sufficient food for the individual and household members. According to Grosvenor and Smolin, (2002) economic changes are common in older adults that increase the risk of food insecurity. The economic changes due to lack of income and assets, as well as to competing demands for money, such as medications, and health care. Curtis et al. (2014) confirms that food insecurity is most often the result of poverty and low income especially among elderly. United States Department of Agriculture has identified high costs (i.e: medication,

food, rent, etc.), low wages and high tax burdens especially on low income person as factors influence food insecurity.

Besides that, there were significant differences between household size and food security status (χ^2 = 10.584, p <0.05). The finding shows that more household size (6 to 10) had higher for low and very low food secures compared than less household size (1 to 5). According to Zalilah and Khor (2008), the larger number of household was more likely to be food insecure. As expected, the higher number of household size, the greater of household expenditure. The household expenditure includes for children education, clothing, and daily expenses such as food. In specifically for elderly, the expenses would be extra preferably for medication and health care. Other than that, the increasing in household size will decrease the per capita food intake. In line with the study by Olayemi (2012), the larger the household size, the lesser food availability to each person within the household. Usually, elderly will take lesser food and increase the risk of food insecurity.

On the other hand, there were a significant difference between marital status and food security status (χ^2 = 11.975, p <0.05). There were more married respondents (82.6%) had fully or marginal food security status rather than low food security status (12.6%) and very low food security status (4.8%). Finding from Temple (2006), showed that anyone who have a partner are less likely than single person to suffer from food insecurity. This is consistent with the theory of health and living arrangements from Lillard and Waite (1995) and Umberson's (1987). The theory agreed that having a spouse provides an important resource, which family can protect from poverty and health problems.

Meanwhile, the mean years of schooling for respondents were found significantly different based on the food security status. Respondents in fully or marginal food security (5.48±4.23) have significantly higher mean years of schooling compared to respondents in low food secure (3.46±3.14) and very low food secure (1.94±2.28). In the present study, the mean years of schooling significantly decreased as food security status worsened. This is consistent with other studies that showed that level of education as one of the factors of food insecurity (De Muro and Burchi, 2007; Faye et al., 2011; Bashir et al., 2012). According to Bhattacharya et al. (2004), the improvement in education leads to better opportunities in occupation, which indirectly can improve economy status and food security level. Lack of education especially related with food and nutrition can increase the incidence of nutrition-related illness. In other hand, education has direct and wider returns to individual and family members as long as for society in terms of increased income, improved health and better decision making (McMahon, 2009).

Next, there were significant difference between age (F=8.86, p<0.001) with the food security status of the respondents. The mean age of respondent showed that the younger respondents (66.40±5.76) were among fully or marginal food secure compared than low food secure (71.26±8.63) and very low food secure (68.47±6.70). Elderly may have other risk factors for food insecurity such as physical limitations. Russell et al., (2014) reported that age is one of the strongest predictors for food insecurity. This is because, older adults usually have physical limitations or chronic health conditions that may limit physical access to food in terms of lifting or being able to carry groceries home or no longer being able to drive. Besides that, physical

limitations for preparing and cooking meals due to aging may influence food insecurity status among elderly compared than other population (Burns et al., 2010).

Table 5: Socio-demographic, Socio-economic Background and Food Security Status of Respondents (n=227)

Characteristics	Fully or marginal food security (n=175)	Low food secure (n=35)	Very low food secure (n=17)	F value	x^2	P value
Age (years)	66.40 ±5.76[a]	71.26 ±8.63[a]	68.47 ±6.70	8.860		<0.001*
Sex						
Male	67 (77.0)	16 (18.4)	4 (4.6)		2.383	0.304
Female	108 (77.1)	19 (13.6)	13 (9.3)			
Marital status						
Married	138 (82.6)	21 (12.6)	8 (4.8)		11.975	0.003**
Widow/widower	37 (61.7)	14 (23.3)	9 (15.0)			
Household size						
1 to 5	142 (80.7)	26 (14.8)	8 (4.5)		10.584	0.005**
6 to 10	33 (64.7)	9 (17.6)	9 (17.6)			
Number of schooling children						
No schooling children	140 (78.2)	26 (14.5)	13 (7.3)		0.634	0.728
Have schooling children	35 (72.9)	9 (18.8)	4 (8.3)			

*Significant at p<0.05 (One-way ANOVA)
**Significant at p<0.05 (Chi-Square)

[a,b](identical symbol) indicates significantly difference between the groups

Table 5 (cont.)

Characteristics	Fully or marginal food security (n=175)	Low food secure (n=35)	Very low food secure (n=17)	F value	x^2	P value
Educational level						
Years of schooling	5.48 ±4.23[ab]	3.46 ±3.14[a]	1.94 ±2.28[b]	8.89		<0.001*
Occupation status						
Employed	44 (83.0)	6 (11.3)	3 (5.7)		1.377	0.502
Unemployed	131 (75.3)	29 (16.7)	14 (8.0)			
Personal monthly income	1109.03 ±834.30[ab]	492.86 ±309.92[a]	567.65 ±299.45[b]	12.552		<0.001*

*Significant at p<0.05 (One-way ANOVA)
**Significant at p<0.05 (Chi-Square)
[a,b](identical symbol) indicates significantly difference between the groups

Table 5 (cont.)

Characteristics	Food Secure n (%) (n=175)	Food Insecure n (%) (n=50)	p-value
Living arrangement			0.752
Living alone	11 (73.3)	4 (26.7)	
Living with others	164 (77.4)	48 (22.6)	

 Fisher's Exact Test

Factors associated with food security status of the respondents
Table 6 presents the factors associated with food security status of the respondents. Household size was found to be a significant factor of food insecurity. The household size of more than five members had 3.959 more likely to become food insecure compared to the household size less than five members. This is supported with the study by Bobatunde et al., (2007) which indicated that larger household size are more likely to be food insecure than small household size. Besides that, the low income elderly (< RM1,000) had 6.469 times more likely food insecure compared than elderly who had income RM1,000 and above. The result shows that income had a stronger association with food insecurity. There is a strong inverse linear relationship between income and food insecurity with four-times the odds of being food insecure in the lowest income quintile compared to the highest. (Carter et al., 2010).

Table 6: Factors that Associated with Food Security Status of Respondents (n=227)

Factors	B	Odds Ratio (OR)	Lower	Upper	p-value
Personal income (< RM1000)	1.867	6.469	2.583	16.203	0.000*
Household size (> 5 members)	1.376	3.959	1.748	8.967	0.001*
	0.396	1.486	0.716	3.086	0.288
Educational level (no schooling)	0.672	1.959	0.961	3.994	0.064
Marital status (widow/widower)					

*p<0.05

Table 7 indicates the data was fit the model well when the significant value for the Omnibus Test of Model Coefficients was less than 0.05 (p=0.000). This strongly supported with Hosmer and Lemeshow Test where significant value of more than 0.05 (p=0.233) that indicated good fit of the model. On the other hand, the model had value for Cox and Snell R squared was 0.164 and Nagelkerke R square was 0.249. That value indicated factors associated with food security status in this model contribute from 16.4% to 24.9% of variation in food security status.

Table 7: The Indication of Binary Logistic Regression Model

Indication of Model	Value
R square	Cox & Snell = 0.164
	Nagelkerke = 0.249
Omnibus Test of Model Coefficients	x^2 =40.762, df =4, p=0.000
Hosmer and Lemeshow Test	x^2= 8.064, p=0.233

Conclusion

This research focused on the socio-economic status and food insecurity among elderly in Panji, Kota Bharu, Kelantan, Malaysia. There were almost one over forth elderly were food insecure. Only household size and monthly income were found to be the significant factor of food insecurity among the elderly in this study.

There is limitation found in this study which can be improved in the future. The findings of this study were limited by the sampling location as the respondents were selected from elderly in Panji District, Kota Bharu, Kelantan only. Therefore, the findings obtained may not generalize or represent the whole population of elderly in Malaysia. Nevertheless, it is still suggested for future study to include the elderly from the entire of Malaysia.

The findings in this study have important implications to elderly itself as well as policy makers. Therefore, it is recommended based on the findings that everyone including NGO, government sectors and community should play important role for old age to ensure food availability and resource of food are continuous. The family members and neighborhood of elderly especially, must be more alert about this problem. Last but not least, food insecure elderly should learn to adopt better coping strategies, while the government should plan the food and nutrition programs and policies for the elderly.

References

Bashir, M. K., Schilizzi, S., & Pandit, R. (2012). The Determinants of Rural Household Food Security for Landless Households o f the Punjab, Pakistan. *Working Paper 1207, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia.*, 13

Bashir, M. K., & Schilizzi, S. (2013). Determinants of rural household food security: A comparative analysis of African and Asian studies. *Journal of the Science of Food and Agriculture*, 93(6), 1251–1258.

Ben-Davies M. E., Kinlaw, A., Estrada del Campo, Y, et al. (2014) Risk factors associated with the presence and severity of food insecurity in rural Honduras. *Public Health Nutr 17*, 5–13

Bhattacharya J, Currie J, Haider S. Poverty, food insecurity, and nutritional outcomes in children and adults. *J Health Econ* 2004, *23*:839-62.

Blumberg, S. J., Bialostosky, K., Hamilton, W. L., & Briefel, R. R. (1999). The effectiveness of a short form of the household food security scale. *American Journal of Public Health*, 89(8), 1231–1234.

Bobatunde.R.O, O. O. . and S. O. S. (2007). Scioeconomic Charateristic and Food Security Status of Farming Households in Kwara State, North Central Nigeria.pdf. *Pakistan Journal of Nutrition, 6, 449-58.*

Burns, C., Bentley, R., Thornton, L., & Kavanagh, A. (2010). Reduced food access due to a lack of money, inability to lift and lack of access to a car for food shopping: a multilevel study in Melbourne, Victoria. *Public Health Nutrition, 14*(6):1017-23.

Carter, K. N., Lanumata, T., Kruse, K., & Gorton, D. (2010). What are the determinants of food insecurity in New Zealand and does this differ for males and females? *Australian and New Zealand Journal of Public Health*, *34*(6), 602–608.

Coleman-Jensen, A., & Nord, M. (2013). Food Insecurity Among Households With Working-Age Adults With Disabilities. *Economic Research Report Number 144*, (144).

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C., & Singh, A. (2015). Household Food Security in the United States in 2014. *Economic Research Report*, (194), 1–43.

Curtis, K. J., Bartfeld, J., & Lessem, S. (2014). Poverty and Food Security in Iron County , Wisconsin.

De Muro, P. and Burchi, F. (2007). Education for Rural People and Food Security a Cross Country Analysis. Food and Agriculture Organization of the United Nations, Rome.

Duerr, L. (2007). Prevalence of food insecurity and comprehensiveness of its measurement for older adult congregate meals program participants. *Journal of Nutrition for Elderly, 25*(3/4): 121-146

Faye, O., Baschieri, A., Falkingham, J., & Muindi, K. (2011). Hunger and food insecurity in Nairobi's slums: An assessment using IRT models. *Journal of Urban Health*, *88*(SUPPL. 2), 235–255.

Food and Agriculture Organization of the United Nations (2004). The state of food insecurity in the world 2004: monitoring progress towards the world food summit and millennium development goals. Rome: FAO.

Gezimu Gebre, G. (2012). Determinants of Food Insecurity among Households in Addis Ababa City, Ethiopia. *Interdisciplinary Description of Complex Systems*, *10*(2), 159–173. https://doi.org/10.7906/indecs.10.2.9

Grosvenor, B. and Smolin, A. (2002). Nutrition from science to life. Philadelphia: *Harcourt College Publishers*.

Hanson, K. L., Sobal, J., Frongillo, E. A. (2007). Gender and marital status clarify associations between food insecurity and body weight. *J Nutr 137*, 1460-1465.

Ihab, A. N., Rohana, A. J., Manan, W. W., Suriati, W. W., Zalilah, M. S., Rusli, A. M. (2012). Food expenditure and diet diversity score are predictors of household food insecurity among low income households in rural district of Kelantan, Malaysia. *Pakistan Journal of Nutrition, 11*(10), 869-875.

Lillard, D. and Waite, L. (1995). Till death do us part: marital disruption and mortality. *American Journal of Sociology*, *100,* 1131–1156.

McMahon, Walter W. (2009). *Higher Learning, Greater Good: The Private and Social Benefits of Higher Education,* Baltimore: Johns Hopkins University Press.

Muhamad Adib Aiman, M. and Norhasmah, S. (2013). Factors associated with food insecurity among Malay elderly in Tanjung Malim, Perak. Department of Nutrition and Dietetics, Universiti Putra Malaysia.

Nord, M., Andrews, M., & Carlson, S. (2009). Household food security in the United States, 2008. Economic Research Report No. (ERR-83). Washington: Department of Agriculture (US); 2009.

Norhasmah, S., Zalilah, M. S., & Asnarulkhadi, A. S. (2010). Food security: concepts and definitions. *Journal of Community Health*, *16*(2), 2-9.

Olayemi, A. O. (2012). Effects of Family Size on Household Food Security in Nigeria. *Asian Journal of Agriculture and Rural Development*, *2*(2), 136–141.

Olson, C. M., Rauschenbach, B. S., Frongillo, E. A., Jr., Kendall, A. (1996). Factors contributing to household food insecurity in a rural upstate New York county. Madison, WI: *Institute for Research on Poverty,* 26 p. (Discussion paper no. 1107-96).

Perintah Gaji Minimum. Putrajaya, Malaysia. Ministry of Human Resources, Malaysia, 2016.

Quandt, S. A., Arcury, T. A., McDonald, J., Ronny, A.B. and Vitolins, M. Z (2001). Meaning and Management of Food Security among Rural Elders. *Journal of Applied Gerontology, 20* (3), 356-376

Report on Household Expenditure Survey. Putrajaya, Malaysia: Department of Statistic, Malaysia, 2010.

Russell, J., Flood, V. M., Yeatman, H., & Mitchell, P. (2014). Prevalence and risk

factors of food insecurity among a cohort of older Australians. *Journal of Nutrition, Health and Aging*, *18*(1), 3–8.

Shariff, Z. M., & Khor, G. L. (2008). Household food insecurity and coping strategies in a poor rural community in Malaysia. *Nutrition Research and Practice*, *2*(1), 26–34.

Sulaiman, N., Shariff, Z. M., Jalil, R. A., Mohd Taib, M. N., Kandiah, M., & Samah, A. A. (2011). Validation of the malaysian coping strategy instrument to measure household food insecurity in Kelantan, Malaysia. *Food and Nutrition Bulletin*, *32*(4), 354–364.

Susilowati. D, & Karyadi,D. (2002). Malnutrition and poverty alleviation. *Asia Pacific of Journal Clinical Nutrition, 11*(S1), S323-S330.

Temple, J. B. (2006). Food insecurity among older Australians: Prevalence, correlates and well-being. *Australasian Journal on Ageing*, *25*(3), 158–163. https://doi.org/10.1111/j.1741-6612.2006.00172.x

Tenth Malaysian Plan 2011-2015. Economic Planning Unit (EPU). Putrajaya, Malaysia: Malaysian National Printing, 2013 & 2014.

Umberson, D. (1987). Family status and health behaviors: social control as a dimension of social integration. *Journal of Health and Social Behavior, 28*, 306–331.

Vermeulen, S. J., Aggarwal, P. K., Ainslie, A., Angelone, C., Campbell, B. M., Chllinor, A. J., Hansen, J. W., Ingram, J. S. I., Jarvis, A., Kristjanson, P., Lau, C., Nelson, G. C., Thornton, P. K. and Wollenberg, E. (2012). Options for support to agriculture and food security under climate change. *Enviromental Science and Policy, 15*,136-144.

Wang, E. A., McGinnis, K. A., Goulet, J., Bryant, K., Gibert, C., Leaf, D. A., Fiellin, D. A. (2015). Food insecurity and health: Data from the veterans aging cohort study. *Public Health Reports*, *130*(3), 261–8

Wolfe, W. S., Olson, C. M., Kendall, A., & Frongillo, E. A. (1996). Understanding Food Insecurity in the Elderly: A Conceptual Framework. *Journal of Nutrition Education*, *28*(2), 92–100.

World Food Summit (1996), Rome Declaration on World Food Security.

Zagorsky, J.L. (2005). Marriage and divorce's impact on wealth. *J Sociol (Melb)*, 41,406–24.

Zalilah, M. S., & Tham, B. L. (2002). Food security and child nutritional status among Orang Asli (Temuan) households in Hulu Langat, Selangor. *The Medical Journal of Malaysia*, *57*(1), 36–50.