

ORIGINAL ARTICLE

Factors Associated with Household Food Insecurity among Mothers in the People's Housing Program (PHP) in Klang Valley, Malaysia

Asrawati Awalina Aslan, Norhasmah Sulaiman, Mohammad Affendy Mhd Akhir, Nur Amalina Amirullah, Nur Arina Bakeri

Department of Nutrition, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

ABSTRACT

Introduction: Urbanization contributed to the rise of the urban poor, and one of the challenges this population faces is food insecurity. This cross-sectional study was conducted to assess the prevalence of household food insecurity and to investigate the factors associated with it among mothers living in People's Housing Program (PHP) in Klang Valley, Malaysia. **Materials and methods:** A total of 315 mothers were recruited and interviewed. The factors studied included socioeconomic (education, employment, income), and psychological variables (stressful life events, depression), and other factors (nutrition knowledge, women empowerment, financial/food assistance). The associations between the factors with food insecurity were analysed using binary logistic regression. **Results:** Among the respondents, 51.4% were food insecure. Mothers with secondary education (AOR = 3.430, 95% CI: 1.490-7.891), mothers who were unemployed (AOR = 3.034, 95% CI: 1.381-6.663), mothers who reported having family problems (AOR = 4.658, 95% CI: 1.625-13.351) and financial constraints (AOR = 2.567, 95% CI: 1.166-5.648), households that received financial assistance (AOR = 2.813, 95% CI: 1.299-6.088), households with monthly income lower than the poverty line income (PLI) (AOR = 2.385, 95% CI: 1.261-4.509), and households that spent 17.3% or more on food expenditure (AOR = 4.040, 95% CI: 1.646-9.919) from their household income were associated with food insecurity. **Conclusion:** Food insecurity is mainly driven by socioeconomic factors, but psychological factors like stress and depression, also contribute significantly. Thus, it is essential to consider both economic and psychological factors when planning interventions on poverty eradication and mental health improvement.

Malaysian Journal of Medicine and Health Sciences (2025) 21(6): 1-13. doi:10.47836/mjmhs.v21.i6.1285

Keywords: Financial assistance, Food security, Maternal depression, Stressful environment, Women empowerment

Corresponding Author:

Norhasmah Sulaiman, PhD

Email: norhasmah@upm.edu.my

Tel : +603-97692461

INTRODUCTION

According to the Food and Agriculture Organization (FAO), food insecurity occurs when there is a limited or uncertain availability or access to nutritionally adequate, culturally relevant, and safe foods; or the inability to access these foods in culturally appropriate ways (1,2). As the world started to recover from the COVID-19 pandemic in 2020, food insecurity had increased sharply since then (3). In Asia, the number of people facing food insecurity rose from 319.9 million in 2015 to 471.1 million in 2020, impacting 10.2% of the population (4). The Malaysian government implemented the first Movement Control Order (MCO 1.0) on 18th March 2020, to curb COVID-19 spread. During this period, a study reported a food insecurity prevalence of 43.2% in

Malaysia (5). These data indicate that vulnerable groups such as the urban poor may be particularly affected with food insecurity.

Malaysia's urban population grew significantly from 28.4% in 1970 to 75.1% in 2020 (6). The Malaysian government is committed to providing adequate and affordable housing for its citizens, particularly targeting the lowest-income group. A key public housing initiative under the Ministry of Housing and Local Government and National Housing Department is the People's Housing Programme (PHP) (7). This plan was introduced in the Seventh Malaysia Plan in 1998, under the guidance of the National Economic Action Council (Majlis Tindakan Ekonomi Negara, MTEN) (8). Low-cost housing was initially developed to tackle squatter issues in urban areas, particularly in cities like Kuala Lumpur (9). However, low-cost housing schemes are often associated with urban poverty. The PHP aimed to address urban housing problems; however, it unintentionally became a symbol of stigma for its residents (10). There

are particularly numerous PHP concentrated in the Klang Valley region. The Klang Valley is an area of 2911.5 km², made up of several districts in Selangor and the Federal Territory of Kuala Lumpur (11). This region has become a focal point for residents due to its diverse job opportunities, quality education, and attractiveness as a place to start a new family (12).

Rapid urban development in Malaysia has reinforced the urban poor phenomenon, disproportionately affecting lower-income residents. They face challenges in allocating their income across essential needs like food, housing, transportation, education, and healthcare due to high city living costs (13). There have been studies investigating factors contributing to food insecurity among low-income households in Malaysia (14,15). However, these studies mostly focused on those living in rural areas. Therefore, this study aimed to assess the prevalence of food insecurity and identify the socio-economic, psychological factors, nutritional knowledge, and women empowerment factors associated with household food insecurity among mothers living in PHP in urban Klang Valley, Malaysia.

MATERIALS AND METHODS

Study design and participants

This cross-sectional study was conducted among mothers aged 19 to 55 years old from selected PHP in Klang Valley, Malaysia. Klang Valley is located in the middle of the state of Selangor, and the Federal Territories of Kuala Lumpur and Putrajaya. However, Putrajaya was excluded from this study since there was no PHP in this area. For Kuala Lumpur, PHP was managed by the Kuala Lumpur City Hall and PHP locations were divided into four zones (Zones I, II, III, and IV) (16). Meanwhile, in Selangor, two districts were chosen: Petaling district and Hulu Langat district. According to Perumahan Hartanah Selangor Sdn Bhd (PHSSB), there were only four PHP in Selangor, and these PHP were located within these two districts. There were 27 PHP projects in Kuala Lumpur, and four PHP projects in Selangor in the Klang Valley (17). Simple random sampling was used to select two PHP from each of the zones and districts.

Sample size calculation

The sample size was calculated using the formulae adapted from Aday and Cornelius (2006)(18) for ensuring an adequate number of observations to estimate the differences in the proportions. The sample size was calculated based on the prevalence of food insecurity (85.2%) among women living in rural households in Negeri Sembilan (19). After proportionate sampling was calculated, adjustment of design effect (deff) was applied as this study utilized stratified cluster samplings. According to Aday & Cornelius (2006) if deff is estimated to be high, then the value of deff is ≥ 2.0 , which was used in this study. The expected response rate was 80.0%, thus additional subjects were included in the sample

size. The final total sample size for this study was 315 mothers aged 19 to 55 years old.

Sampling design

Multi-stage sampling consisting of simple random sampling (SRS) and cluster sampling method were used in this study. After determining where the zones/districts were located, simple random sampling was used to select two PHP from each zone/district. Two PHP were selected per zone/district mainly to fulfil the number of sample size requirements and to have balanced representatives from each zone/district. After selecting PHP from each zone, cluster sampling method was used in the second stage of sampling. All mothers who fulfilled the inclusion and exclusion criteria were invited to participate in this study.

Inclusion and exclusion criteria

Mothers aged 19 to 55 years who resided in the selected PHP were considered as potential respondents for this study. The inclusion criteria were the literacy of mothers - the mother was included if she was able to read and communicate in either Malay or English. The exclusion criteria were if the mother was physically disabled, and mothers who were pregnant and/or lactating.

Instrument and Study variables

The questionnaire consisted of four parts; A: Socioeconomic backgrounds; B: Stressful life events (20); C: Presence of depression (21); D: Nutrition knowledge (22); E: Women empowerment (23); and F: Household food security (24). Socioeconomic background (Part A) comprised mother's personal information and was divided into four parts: Part I: Mother's background (age, ethnicity, marital status, education level, occupation, main and part time work); Part II: Family's Background (number of household members, number of children, financial/food assistance); Part III: Total Household Income; Part IV: Household Expenditure (divided into two parts - household expenditure on food and non-food (transportation, education and others)). Percentage on food expenditure was calculated as such: food expenditure divided by household income and multiplied by 100%.

Stressful life events (Part B) were assessed using eighteen items on stressful life events adapted from the study by Kader Maideen et al. (2014). This part was divided into two parts; first 13 thirteen items assessed respondents' experience with specific life events, with responses being either 'Yes' or 'No'. The second part assessed the relationship of the respondent with their spouse/husband, children, family members, neighbors, and co-workers (if they worked) with the responses being either 'Happy' or 'Unhappy'. Respondents who reported "Yes" or "Unhappy" were considered to experience stressful life event (20). Depression status of respondents (Part C) was assessed using the validated, Malay version of the Patient Health Questionnaire-9 (PHQ-9)(25). PHQ-9

has nine items, and each item was scored from zero to three as the following: 0 = Not at all, 1 = Several days, 2 = More than half the days and 3 = Nearly every day, and the total scores range from zero to 27. The total score classifications include: Mild (score ≤ 5), Moderate (score 6-14), Moderately severe (score 15-19) and Severe depression (score ≥ 20).

Nutrition knowledge (Part D) was assessed using a validated questionnaire developed by the Malaysian Technical Working Group on Research (TWG-R) (22). This questionnaire consists of 20 items revolving nutrition knowledge, and classified into five components: food selection, nutrient function, energy of food, nutrient insufficiency and supplies of nutrients. All the questions are multiple choice questions with five choices of answer. Knowledge scores were calculated by giving one mark for each correct answer and zero mark for incorrect/void answer. Lowest score was zero while the highest score was 20 and scores were later converted into percentage. The scoring is as such: Poor (score 0-10; percentage $\leq 50\%$), Moderate (score 11-14; percentage 51-74%), and Good (score 15-20; percentage $\geq 75\%$).

Women empowerment section (Part E) was adapted from Jennings et al. (2014)(23), a study conducted in assessing women empowerment in prenatal care based on the analysis of the Demographic Health Surveys (DHS) in selected African countries. Due to limited studies of assessing women empowerment status in Malaysian context, the Malay translated version was obtained through the forward and backward translation method by expert panels. Three main dimensions were included in this section; economic empowerment, socio-familial and legal empowerment. Economic empowerment determines the access and control over the economic resources and women participation in financial decisions of the household. Socio-familial empowerment is often defined as women's freedom of mobility and power balance within their social networks. Legal empowerment included women legislative entitlements including on land and property rights. The total composite score was derived from these nine questions, with scores ranging from zero to nine. A score of 0 – 5 showed low empowerment, while a score of 6 – 9 showed high empowerment.

Food security (Part F) was measured using the U.S Household Food Security Survey Module: Six-Item Short Form Survey (24). The first two questions addressed household finances and diet, with four response options: "often true," "sometimes true," "never true," and "refused to answer/don't know." The third question asked if the household had to limit meals due to lack of money, with "yes," "no," or "don't know" as options. If "yes," respondents specified the frequency: "almost every month," "some months but not every month," "only one or two months," or "don't know." The last two questions

assessed feelings about food accessibility with "yes," "no," or "don't know" responses. For scoring, "often" or "sometimes true" (questions 1 and 2) and "yes" (questions 3, 5, and 6) were coded as "yes." For question 4, "almost every month" or "some months but not every month" were coded as "yes." The total food security score was the sum of all "yes" responses. Food security status was classified into two categories: food secure (Score 0 – 1) or food insecure (Score 2 – 6). The questionnaire was prepared in Malay and English.

Data collection

Data collection was conducted from August 2019 to July 2020. Eligible participants were thoroughly informed about the study and asked to provide written consent before participating. About 265 respondents were interviewed face-to-face by the researchers to complete the questionnaire. The remaining 50 respondents were interviewed by phone due to the MCO imposed by the Malaysian government. Interviews were done by a trained postgraduate student and was done in Malay for clarity. After completing the questionnaire, the mothers were given tokens of appreciation.

Data analysis

The IBM Statistical Package for the Social Sciences (SPSS), version 26 was used for statistical analyses. Prior to analysis, the data were explored to ensure all the data obtained were normally distributed. Univariate analysis was used to analyse all the data descriptively. Categorical variables were presented as counts and percentages, while means and standard deviations were applied to continuous variables. The factors associated with food insecurity were determined by bivariate analysis using Chi-square tests or Spearman correlation coefficient. Simple logistic regression was used to determine factors associated with food insecurity and the outcome of food insecurity in the bivariate model. All variables with $p < 0.25$ in the simple logistic regression were included in the binary logistic regression. Binary logistic regression Enter method was used to determine the contributing factors towards food insecurity.

Ethical Clearance

Prior to data collection, ethical approval of research was obtained from the Ethics Committee for Research involving Human Subjects of Universiti Putra Malaysia, IRBNo.UPM/TNCPI/RMC/1.4.18.2(JKEUPM-2019-046). Permission to conduct the study in PHP households in Kuala Lumpur was obtained from the Kuala Lumpur City Hall (DBKL). For Selangor, the information regarding the PHP was obtained from Perumahan Hartanah Selangor Sdn Bhd (PHSSB), a private company hired by Lembaga Perumahan Hartanah Selangor (LPHS). After getting approval from DBKL and PHSSB, permissions and cooperation from the residents' representatives or residents' associations of selected PHP were obtained to conduct the data collection.

RESULTS

About 380 mothers who met all the inclusion criteria were invited to participate in this study. However, only 315 of them agreed and consented to participate, resulting in an overall response rate of 82.9%. The mean age of mothers in this study was 37.4 ± 0.3 years old, with a majority (66.3%) aged between 30 to 39 years old (Table I). Over half of the mothers were Malay (85.4%), followed by Indian (9.8%), and Chinese (4.8%). Most of the mothers were married (84.8%), and 69.5% had more than four family members in their households. The classification of household size was based on the national average household size data by the Department of Statistics in 2019, in which the average household size was 3.8 (26). The majority of mothers completed secondary education (75.5%), while 22.5% had tertiary education. Only 1.3% attained primary education, and 0.6% had no formal education. In terms of employment, the majority of mothers (61.6%) were either unemployed or homemakers. A smaller portion (38.4%) were employed, indicating that many were financially dependent on their spouses. Only 27.3% of the mothers indicated receiving financial support. This assistance came from various sources, with Baitul Mal and the Department of Social Welfare (Jabatan Kebajikan Masyarakat - JKM) being the most common. Regarding food aid, out of 315 respondents, only 12 (3.8%) reported receiving assistance from Baitul Mal. Baitul Mal is a financial and asset management institution in Islam that administers various sources of revenue such as zakat funds, waqf properties, taxes (kharaj and jizyah), and other sources that are collected and used for the benefit of society and the state (27). The mean monthly household income among respondents was RM 2808.90 ± 1345.50 , with median (IQR) of RM 2500.00 (1900.00-3400.00). The majority (91.4%) fell into the B40 group (households earning <RM 4850 per month), while 8.6% were in the M40 category (households earning RM 4850 - RM 10970 per month). Household income classification followed the Household Income and Basic Amenities Survey Report (2019) (28).

Table I: Demographic and socioeconomic background (n=315)

Variables	n (%)	Mean $\pm$ SD
Mother		
Age (years)		37.4 ± 0.3
19 – 29	17 (5.4)	
30 – 39	209 (66.3)	
40 – 49	83 (26.3)	
50 – 55	6 (1.9)	
Ethnicity		
Malay	269 (85.4)	
Indian	31 (9.8)	
Chinese	15 (4.8)	

CONTINUE

Table I: Demographic and socioeconomic background (n=315) (CONT.)

Variables	n (%)	Mean $\pm$ SD
Mother		
Marital status		
Married	267 (84.8)	
Divorced/ Widowed	48 (15.2)	
Household size ¹		5.3 ± 1.4
1 – 4	96 (30.5)	
>4	219 (69.5)	
Education level		
No formal education	2 (0.6)	
Primary education	4 (1.3)	
Secondary education	248 (75.5)	
Tertiary education	71 (22.5)	
Employment status		
Employed	121 (38.4)	
Unemployed/ Housewife	194 (61.6)	
Part time job status		
Yes	34 (10.8)	
No	281 (89.2)	
Received financial assistance		
Yes	86 (27.3)	
No	229 (72.7)	
Received food assistance		
Yes	12 (3.8)	
No	303 (96.2)	
Household monthly income (RM) ²		2808.90 ± 1345.50
B40 (<RM4850)	288 (91.4)	
M40 (RM4850 – RM10970)	27 (8.6)	
Min – max: RM 500-RM9000		
Median (IQR)		2500.00 (1900.00-3400.00)
Household monthly income (RM) based on poverty line income (PLI) ³		
Below PLI (<RM2208)	135 (42.9)	
Above PLI ($\geq$ RM2208)	180 (57.1)	
Total household expenditure (RM) ⁵		1758.80 ± 551.30
$\leq$ 1500	108 (34.3)	
1501 – 3000	198 (62.9)	
>3000	9 (2.9)	
Food expenditure (RM)		608.60 ± 159.20
Percentage expenditure on food (%) ⁵		25.1 ± 11.0
<17.3	73 (23.2)	
$\geq$ 17.3	242 (76.8)	

Abbreviation: IQR, interquartile range. ¹Average household size was 4.31 based on the average family size (persons) by Malaysian Census (2010). ²Income classification based on Household Income and Basic Amenities Survey Report (2019). ³Income category based on the Poverty Line Income (PLI) for urban area in Peninsular Malaysia by Economic Planning Unit (EPU, 2019). ⁴The classification of income per capita was based on 10th Malaysia Plan (20), 1 USD=RM 4.72. ⁵Household Expenditure Survey by Department of Statistics (2019).

Based on the poverty line income (PLI) for Peninsular Malaysia (Household Income & Poverty- Economic Planning Unit (EPU), 2019), 42.9% of respondents in this study fell below the poverty line, with a monthly household income of <RM2208. The mean total expenditure and food expenditure were RM 1758.80 $\pm$ 551.30 and RM 608.60 $\pm$ 159.20 respectively. Overall, the respondents spent approximately 25% of their household income on food expenses. Based on the cut-off point of household expenditure survey (Household Expenditure Survey (HES) (2019)), 76.8% of Malaysian households spent 17.3% or more of their household income on food expenses alone.

Table II shows the distribution of respondents based on various stressful life events. Out of these events, most of the respondents (40.6%) reported experiencing loss of family members/relatives/close friends, followed by

serious financial constraints (27.6%), having at least one chronic disease (22.2%) and experiencing serious family problems (18.7%). About 11.7% of respondents admitted being unhappy with their spouse.

More than half of the respondents (78.4%) had no symptoms of depression and 18.7% of them were categorized in the mild depression group. The remaining respondents were categorized in moderate (2.2%) and moderately severe group (0.6%) (Table II). Those with symptoms of depression were those who had an overall score of 10 and above; thus those in the moderate, moderately severe, and severe categories were considered to have depression (21). In terms of food insecurity, over half of the respondents (51.4%) were categorized as food insecure, while 48.6% were categorized as food secure (Table II).

Table II: Distribution of respondents based on stressful life events, depression scale, nutrition knowledge, women's empowerment, and prevalence of household food insecurity (n=315)

Items for stressful life events	n (%)	
	Yes	No
Presence of chronic diseases	70 (22.2)	245 (77.8)
Abused during childhood	5 (1.6)	310 (98.4)
Serious injury due to accidents	32 (10.2)	283 (89.8)
Loss of family members/relatives/close friends	128 (40.6)	187 (59.4)
Serious marital problem	41 (13.0)	274 (87.0)
Serious family problem	59 (18.7)	256 (81.3)
Serious financial constraints	87 (27.6)	228 (72.4)
Serious housing problem	13 (4.1)	302 (95.9)
Serious problems at work	5 (1.6)	310 (98.4)
Lost job/ Unemployed	11 (3.5)	304 (96.5)
	Happy	Unhappy
Relationship with spouse	278 (88.3)	37 (11.7)
Relationship with children	315 (100)	0 (0.0)
Relationship with family	311 (98.7)	4 (1.3)
Relationship with work	312 (99.0)	3 (1.0)
Relationship with neighbours	315 (100)	0 (0.0)
Overall score of depression¹	Score range	n (%)
Total Score		Mean $\pm$ SD
Category:		
No symptom	0	247 (78.4)
Mild	≤ 5	59 (18.7)
Moderate	6-14	7 (2.2)
Moderately severe	15 and above	2 (0.6)
Nutrition knowledge category²	Score range	n (%)
	(Percentage range)	Mean $\pm$ SD
Nutrition knowledge	0-20	
(Percent score (%))	(0 – 100)	64.2% $\pm$ 16.2
Category:		
Poor	0-10 (0 – 50)	73 (23.2)
Moderate	11-14 (51 – 74)	140 (44.4)
Good	15-20 (75 – 100)	102 (32.4)

CONTINUE

Table II: Distribution of respondents based on stressful life events, depression scale, nutrition knowledge, women's empowerment, and prevalence of household food insecurity (n=315) (CONT.)

Women's empowerment ³	Score range	n (%)	Mean ± SD
Total Score			5.4 ± 1.6
Category:			
Low empowerment	0-5	99 (31.4)	
High empowerment	6-9	216 (68.6)	
Food security status	Score	n (%)	
Food Secure ⁴	0 – 1	153 (48.6)	
Food Insecure ⁴	2 – 6	162 (51.4)	

¹Total depression score classifications based on Kroenke & Spitzer (2002) (20). Score ≥ 10 indicated symptoms of depression.

²Based on Malaysian Technical Working Group on Research (TWG-R) by Karim et al., 2008 (22).

³The classification of women empowerment was based on Jennings et al. (2014) (23).

⁴Food security status was classified based on US Department of Agriculture (USDA) guidelines: food secure (score 0–1) and food insecure (score 2–6) (24).

Several demographic and socioeconomic factors were significantly associated with food security status (Table III). Mother's age was significantly associated with food security status ($X^2 = 4.245$, $p < 0.05$), whereby the prevalence of food insecurity was significantly higher among young mothers aged between 19 to 39 years old (66.7%) compared to mothers aged 40 years old and above (33.3%). Ethnicity was also significantly associated with food security status ($X^2 = 10.881$, $p < 0.004$) with

the highest number of food insecure households being Malay (86.4%), compared to non-Malay households (13.6%). Besides, marital status was also found to be significantly associated with food security status ($X^2 = 3.923$, $p < 0.05$). For those who were married, more of them were food secure (88.9%), while for those who were divorced/widowed, slightly more of them were food insecure (19.1%).

Table III: Association between demographic and socioeconomic background and food security status

Variables	Food Secure n (%)	Food Insecure n (%)	X^2	p
Mother				
Age (years)			4.245	0.039*
19 – 39 (n=226)	118 (77.1)	108 (66.7)		
≥40 (n=89)	35 (22.9)	54 (33.3)		
Ethnicity			10.881	0.597
Malay (n=269)	129 (84.3)	140 (86.4)		
Non-Malay (n=46)	24 (15.7)	22 (13.6)		
Marital Status			3.923	0.048*
Married (n=267)	136 (88.9)	131 (80.9)		
Divorced/ Widowed (n=48)	17 (11.1)	31 (19.1)		
Household size			7.801	0.020*
1 – 3 (n=29)	19 (12.4)	10 (6.2)		
4 – 6 (n=231)	115 (75.2)	116 (71.6)		
≥7 (n=55)	19 (12.4)	36 (22.2)		
Education level			10.598	0.001**
Secondary and below (n=244)	99 (79.8)	145 (92.9)		
Tertiary education (n=36)	25 (20.2)	11 (7.1)		
Employment status			10.876	0.001**
Employed (n=121)	73 (47.7)	48 (29.6)		
Unemployed/ Housewife (n=194)	80 (52.3)	114 (70.4)		
Part time job status			9.568	0.002*
Yes (n=34)	8 (23.5)	26 (16.0)		
No (n=281)	145 (94.8)	136 (84.0)		
Received financial assistance			45.892	<0.001**
Yes (n=86)	15 (9.8)	71 (43.8)		
No (n=229)	138 (90.2)	91 (56.2)		
Received food assistance			5.084	0.024*
Yes (n=12)	2 (1.3)	10 (6.2)		
No (n=303)	151 (98.7)	152 (93.8)		
Household monthly income (RM)			-0.540 [†]	<0.001**

CONTINUE

Table III: Association between demographic and socioeconomic background and food security status (CONY.)

Variables	Food Secure n (%)	Food Insecure n (%)	χ^2	p
Household monthly income (RM) based on poverty line income (PLI)			65.663	<0.001**
Below PLI (<RM2208) (n=135)	30 (19.6)	105 (64.8)		
Above PLI ($\geq$ RM2208) (n=180)	123 (80.4)	57 (35.2)		
Percentage expenditure on food (%)			54.151	<0.001**
<17.3 (n=73)	63 (41.2)	10 (6.2)		
$\geq$ 17.3 (n=242)	90 (58.8)	152 (93.8)		

*Significant at level $p < 0.05$, **Significant at level $p < 0.01$.

†Analysis using Spearman's correlation.

Household size was significantly associated with food insecurity ($X^2 = 7.801$, $p < 0.05$). Food insecurity was higher in larger households, which were those with four to six members (71.6%) and those with seven or more members (22.2%). Mother's education level was significantly linked to food security status ($X^2 = 10.598$, $p < 0.001$). Food insecurity was highest among households where mothers had secondary education or below (92.9%). Most mothers with tertiary education were in food secure households (20.2%). In terms of employment, the prevalence of food insecurity was higher in unemployed or housewife mothers (70.4%) ($X^2 = 10.876$, $p < 0.001$) compared to those who were employed. Part time job status was significantly associated with food secure status ($X^2 = 9.568$, $p < 0.01$). Most mothers in food secure households had no part time jobs (94.8%). Similarly, 84.0% of those in food insecure households had no part time jobs.

Households receiving both financial aids ($X^2 = 45.892$, $p < 0.001$) and food assistance ($X^2 = 5.084$, $p < 0.05$) were significantly associated with food insecurity. In terms of financial aid, a high proportion of those in food secure households did not receive any financial aid (90.2%). In food insecure households, 56.2% did not receive any financial aid, while 43.8% did receive aid. Most respondents did not receive any food assistance, both for those in food secure households (98.7%), and food insecure households (93.8%).

A higher household income was negatively correlated with food insecurity (Spearman correlation coefficient, $r_s = -0.540$, $p < 0.001$). As for income based on PLI, household income was significantly associated with food security status ($X^2 = 65.663$, $p < 0.001$) where the prevalence of food insecurity was higher among poor households with income <RM2208 (64.8%). Percentage expenditure on food ($X^2 = 54.151$, $p < 0.001$) was significantly associated with food insecurity status. Prevalence of food insecurity was higher among those who spent 17.3% or more of their total income on foods (93.8%) compared to those who spent less than 17.3% of their total income on food expenses (6.2%).

There were a few life events that were significantly associated with food insecurity. Serious marital problems ($X^2 = 21.773$, $p < 0.001$), serious family problems ($X^2 = 42.859$, $p < 0.001$), and serious financial constraints ($X^2 = 37.407$, $p < 0.001$) were significantly associated with food insecurity (Table IV). The severity of depression ($X^2 = 6.326$, $p < 0.05$) was significantly associated with food insecurity. Most of the respondents had mild depression from both food secure (92.2%) and food insecure (82.7%) households. However, more respondents in food insecure households had moderate/severe depression (17.3%) compared to those in food secure households (7.84%).

Table IV: Association between stressful life events, depression status, nutrition knowledge, and women empowerment with food insecurity

Variables	Food Secure n (%)	Food Insecure n (%)	χ^2	p
Presence of chronic diseases			2.647	0.104
Yes (n=70)	28 (18.3)	42 (25.9)		
No (n=245)	125 (81.7)	120 (74.1)		
Serious injury due to accidents			0.296	0.587
Yes (n=32)	17 (11.1)	15 (19.3)		
No (n=283)	136 (88.9)	147 (90.7)		
Loss of family members/ relatives/ close friends			0.072	0.788
Yes (n=128)	61 (39.9)	67 (41.4)		
No (n=187)	92 (60.1)	95 (58.6)		
Serious marital problem			21.733	<0.001***
Yes (n=41)	6 (3.9)	35 (21.6)		
No (n=274)	147 (96.1)	127 (78.4)		

CONTINUE

Table IV: Association between stressful life events, depression status, nutrition knowledge, and women empowerment with food insecurity (CONT.)

Variables	Food Secure n (%)	Food Insecure n (%)	χ^2	p
Serious family problem			42.859	<0.001***
Yes (n=59)	6 (3.9)	53 (32.7)		
No (n=256)	147 (96.1)	109 (67.3)		
Serious financial constraints			37.407	<0.001***
Yes (n=87)	18 (11.8)	69 (42.6)		
No (n=228)	135 (88.2)	93 (57.4)		
Relationship with spouse			17.570	<0.001***
Happy (n=278)	147 (96.1)	131 (80.9)		
Unhappy (n=37)	6 (3.9)	31 (19.1)		
Severity of depression			6.326	0.012*
Mild (n=275)	141 (92.2)	134 (82.7)		
Moderate/severe (n=40)	12 (7.8)	28 (17.3)		
Nutrition knowledge			6.384	0.012*
Poor (n=73)	26 (17.0)	47 (20.0)		
Moderate/Good (n=242)	127 (83.0)	115 (71.0)		
Women empowerment			1.341	0.247
Low empowerment (n=98)	43 (28.1)	55 (34.2)		
Highly empowered (n=216)	110 (71.9)	106 (65.8)		

*Significant at level $p<0.05$, **Significant at level $p<0.01$, ***Significant at level $p<0.001$

Simple logistic regression showed that mother's employment status, receiving financial assistance, monthly income based on PLI, percentage expenditure on food, and serious family problems were associated with food insecurity ($p<0.05$) (Table V). In the adjusted analysis, factors that remained as significant factors associated with food insecurity were mother's education and employment, households that received

financial aids, household monthly income based on PLI, percentage expenditure on food, serious family problems, and serious financial constraints ($p<0.05$) (Table V). The R Square for Cox & Snell and Nagelkerke were 0.408 and 0.544 respectively, which indicated that between 40.8% and 54.4% of variation in food insecurity was explained by the factors fitted in the model.

Table V: Association of independent variables with food insecurity, and factors associated with food insecurity

Factors	B	Crude OR (95% CI)	Sig.	B	Adjusted OR (95% CI)	Sig.
Demographic and Socioeconomic Background						
Age (years)						
19 – 39	-0.494	0.610 (0.285-1.306)	0.203	-0.436	0.647 (0.328-1.273)	0.207
≥40 (ref)		1.00			1.00	
Ethnicity						
Non-Malay	0.518	1.678 (0.635-4.436)	0.296			
Malay (ref)		1.00				
Marital Status						
Divorced/ Widowed	-0.408	0.665 (0.153-2.885)	0.586			
Married (ref)		1.00				
Household size						
≥7	-0.202	0.817 (0.112-5.933)	0.842			
4 – 6	-0.059	0.942 (0.494-1.799)	0.858			
1 – 3 (ref)		1.00				

CONTINUE

Table V: Association of independent variables with food insecurity, and factors associated with food insecurity (CONT.)

Factors	B	Crude OR (95% CI)	Sig.	B	Adjusted OR (95% CI)	Sig.
Demographic and Socioeconomic Background						
Education level						
Secondary and below	1.056	2.875 (1.189-6.952)	0.19	1.232	3.430 (1.490-7.891)	0.004**
Tertiary education (ref)		1.00			1.00	
Employment status						
Unemployed/ Housewife	1.073	2.925 (1.146-7.469)	0.025*	1.110	3.034 (1.381-6.663)	0.006**
Employed (ref)		1.00			1.00	
Part time job status						
Yes	0.556	1.743 (0.571-5.319)	0.329			
No (ref)		1.00				
Household received financial assistance						
Yes	1.112	3.040 (1.314-7.030)	0.009**	1.034	2.813 (1.299-6.088)	0.009**
No (ref)		1.00			1.00	
Household received food assistance						
Yes	-0.024	0.977 (0.135-7.030)	0.981			
No (ref)		1.00				
Household monthly Income (RM)						
	0.000	1.000 (0.999-1.000)	0.673			
Household monthly income (RM) based on poverty line income (PLI)						
<RM2208 (Below PLI)	0.712	2.038 (0.798-5.204)	0.136	0.869	2.385 (1.261-4.509)	0.007**
≥RM2208 (Above PLI) (ref)		1.00			1.00	
Percentage expenditure on food (%)						
≥17.3	1.421	4.141 (1.502-11.418)	0.006**	1.396	4.040 (1.646-9.919)	0.002**
<17.3 (ref)		1.00			1.00	
Stressful Life Events						
Serious marital problem						
Yes	1.531	4.622 (0.465-45.940)	0.191	1.627	5.088 (0.652-39.697)	0.121
No (ref)		1.00			1.00	
Serious family problem						
Yes	1.529	4.614 (1.614-13.193)	0.004**	1.539	4.658 (1.625-13.351)	0.004**
No (ref)		1.00			1.00	
Serious financial constraints						
Yes	0.754	2.125 (0.941-4.801)	0.070	0.943	2.567 (1.166-5.648)	0.019*
No (ref)		1.00			1.00	
Relationship with spouse						
Unhappy	0.931	2.538 (0.201-31.998)	0.471		1.779 (0.207-15.261)	
Happy (ref)		1.00		0.576	1.00	0.599
Depression Status						
Moderate/Severe	0.727	2.068 (0.765-5.586)	0.152	0.718	2.049 (0.775-5.419)	0.148
Mild (ref)		1.00			1.00	
Nutrition knowledge						
Poor	0.237	1.267 (0.603-2.661)	0.531			
Moderate /Good (ref)		1.00				

*Significant at level $p < 0.05$; **Significant at level $p < 0.01$ For binary logistic regression: Cox & Snell $R^2 = 0.408$, Nagelkerke $R^2 = 0.544$; Hosmer and Lemeshow Test: $\chi^2 = 4.356$, $df = 8$, $p = 0.824$

Mothers with secondary education were 3.4 times more likely to be food insecure compared to those with tertiary education (AOR = 3.430, 95% CI: 1.490-7.891). Similarly, unemployed mothers were 3.0 times more likely than employed mothers to be food insecure (AOR = 3.034, 95% CI: 1.381-6.663). Households that received financial aid were 2.8 times more likely to be food insecure compared to those who did not receive financial aid (AOR = 2.813, 95% CI: 1.299-6.088). In terms of PLI, households with monthly income lower than the PLI were 2.4 times more likely to be food insecure than those households with monthly income higher than the PLI (AOR = 2.385, 95% CI: 1.261-4.509). Next, households that spent 17.3% or more of their expenditure on food were 4.0 times more likely to be food insecure than households that spent less than 17.3% for food (AOR = 4.040, 95% CI: 1.646-9.919). In terms of stressful events, mothers who reported to having serious family problems were 4.7 times more likely to be food insecure than those who did not report having family problems (AOR = 4.658, 95% CI: 1.625-13.351). Meanwhile, mothers who reported to have serious financial constraints were 2.6 times more likely to be food insecure than those who did not report any financial constraints (AOR = 2.567, 95% CI: 1.166-5.648).

Therefore, mother's education and employment, households that received financial aids, household monthly income based on PLI, percentage expenditure on food, serious family problems, and serious financial constraints were factors contributing to food insecurity and contributed 54.4% of the variance in food insecurity.

DISCUSSION

In this study, 34.8% of the respondents were working women, a higher proportion than in previous studies involving women with children (31). However, compared to studies conducted in rural areas, this study found a lower percentage of working mothers (32). This may be because rural families often have more children and fewer resources, compelling more women to work to support their families. Most households in this study fell into the B40 group, earning less than RM 4850 per month, with only 8.6% in the M40 group (28). The findings align with the Household Income Estimates and Incidence Poverty Rate Malaysia 2020 report by DOSM (2021), which noted a decline in household income due to the COVID-19 pandemic (33).

The current study found food insecurity prevalence of 51.4% in urban areas of Malaysia. This is significantly lower than previous findings among local communities in Malaysia. Mat Ya et al. (2017) reported a 77.0% prevalence in Pahang (31), and Ihab et al. (2013) found an 83.9% prevalence of food insecurity (34). These differences may be attributed to the different locations of the studies – Mat Ya et al. (2017) conducted their

study in Kuantan, Pahang (and the population studied included both urban and rural populations), whereas Ihab et al. (2013) conducted their studies in the district of Bachok, Kelantan. Nevertheless, this study's findings showed that more than half of mothers in urban poor settings face household food insecurities. The United Nations (UN) Sustainable Development Goal (SDG) 2 is to achieve Zero Hunger by 2030 (35). The UN 2023 SDG report states that rising cost of living as one possible contributors to hunger (36). This also aligns with the results in this study, which showed that financial constraints were one of the stressful life events that affected these mothers.

According to the binary logistic regressions, the adjusted results of the current study showed the main factors associated with food insecurity were mother's education level and employment status, households that received financial aids, household monthly income based on PLI, percentage expenditure on food, serious family problems, and serious financial constraint ($p < 0.05$).

Several studies have shown that parental education have an impact on food security, with higher education being associated with food security (37,38). Lower levels of education often correlate with lower income, reduced employment opportunities, and limited access to resources (39), all of which contribute to food insecurity. Lower educational attainment is associated with lower-paying jobs and less stable employment. This is also consistent with the findings of this study, which showed that unemployed mothers were also more likely to be food insecure.

A study among college students found that receiving multiple forms of financial aid predicted food insecurity (40). This is similar to the findings of the current study, where households that received financial aid were associated with food insecurity. Food insecure households may be more likely to be eligible for these financial aids, compared to food secure households. People in food insecure households may also be more likely to seek these aids compared to their food secure counterparts. Financial assistance can help cover expenses and increase food resource allocation, acting as a protection against food insecurity. However, some food-insecure households avoid seeking help from welfare agencies due to reluctance to publicize their problems, using these resources only as a last resort (41).

The current study found that higher food expenditure percentage positively correlated with food insecurity, echoing similar findings in two other Malaysian studies (34,42). Note that the measure used was the proportion or percentage of the household expenditure spent on food. As food is a necessity, a household is assumed to spend a portion of its income on food. The proportion of income spent on food by a household serves as an indicator of their food security status. Households

that are poorer and more vulnerable allocate a higher percentage of their income to food (43). This makes these households at risk of future food deprivation. If their income decreases due to factors such as job loss, natural disasters, disease, or changes in price policies, they will have limited resources to meet their food needs (44). Our study also showed that those living below PLI were more likely to be food insecure. Households with lower monthly incomes are more prone to experiencing food insecurity, often resorting to coping strategies such as reducing the number of daily meals, consuming smaller portions, or opting for lower-quality and less expensive foods due to their limited resources (45).

Aside from socioeconomic factors, stressful events were also linked to food insecurity. Income consistently emerges as a strong predictor of food insecurity, with financial constraints increasing the risk of households facing food insecurity (46). Similar observations were made in this study, as a higher proportion of mother who reported to have financial constraints was food insecure (42.6%), while a smaller proportion was food secure (11.8%). Financial constraints can lead to the inability to meet food expenditures, necessitating asset liquidation or borrowing to maintain food levels. Unsecured debts, like medical or housing expenses, further exacerbate food insecurity, with households at higher risk of food insecurity when experiencing such debts (47).

Besides financial worries, mothers who reported having serious family problems were also more likely to be food insecure, as a higher proportion of mothers (32.7%) who reported to experience serious family problems was food insecure, while only a small proportion was food secure (3.9%). (Table IV). These are serious stressful events that affected the mothers. Some studies have shown the effects of psychological stress on maternal health (and subsequently child's health, in some cases) (48). Financial problems impact not only financial satisfaction but also marital satisfaction and overall quality of life (49). Other psychological factors include presence of depression. Less than 5% of mothers in this study showed symptoms of depression (2.9%), similar to the 2.6% prevalence among Malaysian women reported by the National Health and Morbidity Survey (NHMS) 2019 (50). The NHMS 2019 reported a higher prevalence of depression among B40 households (2.7%) compared to M40 (1.7%) and T20 (0.5%) households, which matched this study's population, who were predominantly from B40 households (50).

Results from this study proved that sociodemographic and economic characteristics still play a major role in food insecurity. The strength of this study is that the sample size is relatively bigger than previous local studies and focused on aspects that were not commonly investigated as of yet, such as the psychological well-being of the mothers and women empowerment. However, this study is limited by its cross-sectional design, which makes it

difficult to draw causal inferences. This design provides a snapshot of information at a single point in time, rather than tracking development over time. Regardless, future intervention or prevention programs need to carefully assess the needs of the urban poor, especially in regard to income and economic development. A less common focus is the psychological well-being of mothers (and caretakers). As this study shows, having family problems and financial worries also contribute significantly to food insecurity. As such, financial assistance alone may not be sufficient. Giving assistance in the form of support for mental health or counselling may also be beneficial to the urban poor community and is worthwhile to be pursued. Multiple stakeholders, from government agencies, private entities, and non-governmental organizations (NGOs) need to play their role to alleviate food insecurity in urban areas.

CONCLUSION

The findings of this study can serve as baseline data for identifying factors associated with household food insecurity (such as sociodemographic and economic backgrounds, stressful life events) and understanding the factors that contribute to household food insecurity among mothers living in PHP in Klang Valley. Food security is a complex issue that requires multifaceted solutions and the involvement of various stakeholders. Our study proved that while socioeconomic factors remain as the major contributors to food insecurity, other aspects (such as psychological health) are also important and need serious consideration when planning suitable interventions.

ACKNOWLEDGEMENT

The authors would like to thank the Kuala Lumpur City Hall (DBKL), the *Perumahan Hartanah Selangor Sdn Bhd* (PHSSB), the *Lembaga Perumahan Hartanah Selangor* (LPHS), residents' representatives and associations of selected PHP, as well as the mothers who were willing to participate in this study. Their involvement had been an invaluable source of information, and provided eye-opening experiences. This work was made possible due to funding from Geran Putra, Universiti Putra Malaysia (Project. No.: GP/2018/9639500).

REFERENCES

1. FAO. *The State of Food Insecurity in the World Economic Crises – Impacts and Lessons Learned*; 2009.
2. Anderson SA. Core Indicators of Nutritional State for Difficult-to-Sample Populations. *J Nutr.* 1990;120:1555-1598. doi:10.1093/jn/120.suppl_11.1555
3. FAO, IFAD, UNICEF, WFP and WHO. *The State of Food Security and Nutrition in the World*. 2023. doi:10.4060/cc3017en

4. FAO, IFAD, UNICEF W and WHO. *The State of Food Security and Nutrition in the World*. 2021. doi:10.4060/cb5409en
5. Tan ST, Tan CX, Tan SS. Food security during the COVID-19 home confinement: A cross-sectional study focusing on adults in Malaysia. *Hum Nutr Metab*. 2022;27:200142. doi:10.1016/j.hnm.2022.200142
6. Department of Statistic Malaysia. *Menelusuri Statistik Sosial Malaysia*; 2024. <https://www.padu.gov.my>
7. Mohd Shukri MZ, Abdul-Rahim AS. Assessing the stakeholders's attitudes and support towards the development of the People's House Program (PHP) Sri Aman, Kepong, Kuala Lumpur. *Int J Acad Res Progress Educ Dev*. 2023;12(3). doi:10.6007/ijarped/v12-i3/18996
8. Khazanah Research Institute. Decent Shelter for The urban poor a study of Program Perumahan Rakyat. Published online 2023:14-21.
9. Aqilah Azman A, Hafizah Mohamed Harith N. Determinants of residential satisfaction towards People Housing Programme at PPR Melana Indah (Fasa 1), Johor Bahru. *J Adm Sci*. 2020;17(2):92-108.
10. Mat Asek B. Implications of the people's housing programme policy. *J Adm Sci*. 2012;9(2):43-62.
11. Radzi Bin Abas M, Rahman NA, Omar NYM., et al. Organic composition of aerosol particulate matter during a haze episode in Kuala Lumpur, Malaysia. *Atmos Environ*. 2004;38(25):4223-4241. doi:10.1016/j.atmosenv.2004.01.048
12. Zyed ZAS, Badrudin IS, Tedong PA. From homeless to home: issues and challenges of housing continuity in Klang Valley, Malaysia. *Int J Hous Mark Anal*. Published online February 21, 2024. doi:10.1108/IJHMA-11-2023-0157
13. Aziz SSAA, Ismail NS. The research of Islamic sustainable urbanization in the issue of urban poor to achieve food security in Malaysia work. *Int J Recent Technol Eng*. 2019;8(2 Special issue 3):319-324. doi:10.35940/ijrte.B1055.07825319
14. Mohd Shariff Z, Khor GL. Indicators and nutritional outcomes of household food insecurity among a sample of rural Malaysian women. *Pakistan J Nutr*. 2003;3(1):50-55. doi:10.3923/pjn.2004.50.55
15. Norhasmah S, Zalilah MS, Kandiah M, Mohd Nasir MT, Asnarulkhadi AS. Household food insecurity among urban welfare recipient households in Hulu Langat, Selangor. *Pertanika J Soc Sci Humanit*. 2012;20(2):405-420.
16. Zone Offices and Public Housing. Kuala Lumpur City Hall, DBKL. Published 2024. Accessed October 29, 2024. <https://www.dbkl.gov.my/senarai-nombor-telefon-pejabat-zon-dan-perumahan-awam/>
17. TEDUH | National Housing Data Bank System. Ministry of Local Government Development. Published 2024. Accessed October 29, 2024. <https://teduh.kpkt.gov.my/>
18. Aday LA, Cornelius LJ. *Designing and Conducting Health Surveys: A Comprehensive Guide*. 3rd ed. Jossey-Bass; 2006.
19. Mohamadpour M, Mohd Sharif Z, Avakh Keysami M. Food insecurity, health and nutritional status among sample of palm-plantation households in Malaysia. *J Heal Popul Nutr*. 2012;30(3):291-302. doi:10.3329/jhpn.v30i3.12292
20. Kader Maideen SF, Mohd Sidik S, Rampal L, Mukhtar F. Prevalence, associated factors and predictors of depression among adults in the community of Selangor, Malaysia. *PLoS One*. 2014;9(4). doi:10.1371/journal.pone.0095395
21. Sherina MS, Arroll B, Goodyear-Smith F. Criterion validity of the PHQ-9 (Malay version) in a primary care clinic in Malaysia. *Med J Malaysia*. 2012;67(3):309-315.
22. Karim NA, Nik Shanita S, Mohd Yusof S, et al. Nutrition knowledge among Malaysian elderly. *J Sains Kesihat Malaysia*. 2008;6(2):43-54.
23. Jennings L, Na M, Cherewick M, Hindin M, Mullany B, Ahmed S. Women's empowerment and male involvement in antenatal care: Analyses of Demographic and Health Surveys (DHS) in selected African countries. *BMC Pregnancy Childbirth*. 2014;14(1):1-11. doi:10.1186/1471-2393-14-297
24. U.S. Household food security survey module: Six-item short form. *Econ Res Serv USDA*. 2012;(September).
25. Sidik SM, Arroll B, Goodyear-Smith F, Ahmad R. Prevalence of depression among women attending a primary urban care clinic in Malaysia. *Singapore Med J*. 2012;53(7):468-473.
26. Department of Statistic Malaysia. *Household Expenditure Survey Report*; 2022.
27. Council of Islamic Religion and Malay Customs of Kelantan. BaitulMal Services and Management. Published 2024. Accessed November 6, 2024.
28. *Household Income And Basic Amenities Survey Report* (HIS) 2019. Department of Statistics, Malaysia; 2019.
29. *Household Income & Poverty- Economic Planning Unit* (EPU) 2019.; 2019.
30. *Household Expenditure Survey* (HES) 2019.; 2019.
31. Mat Ya R, Mohd Abu Bakar WA, Afandi A, Ab Rahman J, Mohd Shariff Z. Food security status and childhood obesity in Kuantan, Pahang. *Int J Allied Heal Sci*. 2017;(July):57-71.
32. Aslan AA, Sulaiman N. Overweight and obesity among children: A relationship between maternal beliefs and feeding practices with children's body mass index-for-age in bandar and jugra kuala langat selangor. *Malaysian J Med Heal Sci*. 2020;16(6):11-18.
33. World Bank. Poverty & Equity Brief Malaysia- East Asia & Pacific. 2023;(April). www.worldbank.org/poverty
34. Ihab AN, Rohana AJ, Wan Manan WM, Wan Suriati

- WN, Zalilah MS, Mohamed Rusli A. Nutritional outcomes related to household food insecurity among mothers in rural Malaysia. *J Heal Popul Nutr.* 2013;31(4):480-489. doi:10.3329/jhpn.v31i4.20031
35. United Nations (UN). SDGs Report 2023. *Sustain Dev Goals Rep 2023 Spec Ed.* Published online 2023:80.
36. United Nations (UN). *SDGs Report 2023. The Sustainable development Goals Report 2023: Special Edition.* 2023. p. 80.
37. Niehof A. Food and nutrition security as gendered social practice. *Appl Stud Agribus Commer.* 2016;10(2-3):59-66. doi:10.19041/apstract/2016/2-3/7
38. Yadav SS, Matela H, Panchal P, Menon K. Household food insecurity, dietary diversity with undernutrition among children younger than five years in Indian subcontinent—a narrative review. *Lancet Reg Heal - Southeast Asia.* 2024;26:100426. doi:10.1016/j.lansea.2024.100426
39. Eick SM, Goin DE, Izano MA, et al. Relationships between psychosocial stressors among pregnant women in San Francisco: A path analysis. *PLoS One.* 2020;15(6):1-16. doi:10.1371/journal.pone.0234579
40. Payne-Sturges DC, Tjaden A, Caldeira KM, Vincent KB, Arria AM. Student hunger on campus: food insecurity among college students and implications for academic institutions. *Am J Heal Promot.* 2018;32(2):349-354. doi:10.1177/0890117117719620
41. Tarasuk V, Fafard St-Germain AA, Mitchell A. Geographic and socio-demographic predictors of household food insecurity in Canada, 2011–12. *BMC Public Health.* 2019;19(1):12. doi:10.1186/s12889-018-6344-2
42. Ali Naser I, Jalil R, Wan Muda WM, Wan Nik WS, Mohd Shariff Z, Abdullah MR. Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia. *Nutr Res Pract.* 2014;8(3):304. doi:10.4162/nrp.2014.8.3.304
43. Data4Diets: Building blocks for diet-related food security analysis, Version 2.0. Tufts University.
44. Smith LC. *Keynote Paper: The Use of Household Expenditure Surveys for the Assessment of Food Insecurity.*; 2015.
45. Siwar C, Ahmed F, Begum RA. Household food insecurity, nutritional outcome and coping strategies: Evidence from Malaysia. *J Food, Agric Environ.* 2014;12(1):19-23.
46. Seivwright AN, Callis Z, Flatau P. Food Insecurity and Socioeconomic Disadvantage in Australia. *Int J Environ Res Public Health.* 2020;17(2):559. doi:10.3390/ijerph17020559
47. Chang Y, Chatterjee S, Kim J. Household finance and food insecurity. *J Fam Econ Issues.* 2014;35(4):499-515. doi:10.1007/s10834-013-9382-z
48. Uzobo E, Dudafa JU, Boroh SE. Food insecurity and depression among single mothers in Kolokuma/Opokuma Local Government Area of Bayelsa State, Nigeria. *African Res Rev.* 2017;11(1):75. doi:10.4314/afrrev.v11i1.6
49. Copur Z, Eker I. The relationship between financial issues and marital relationship. *Int J Arts Sci.* 2014;7(5):683-697.
50. Institute for Public Health. *National Health and Morbidity Survey (NHMS) 2019: NCDs - Non-Communicable Diseases: Risk Factors and Other Health Problems.* Vol 1. Ministry of Health, Malaysia; 2020. <http://www.iku.gov.my/nhms-2019>