

Demographic factors, food security, health-related quality of life and body weight status of adolescents in rural area in Mentakab, Pahang, Malaysia

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ABSTRACT

Introduction: Adequate, nutritive and safe foods are crucial for growth and healthy living. Adolescents are vulnerable to food insecurity. This study was aimed at determining the demographic factors, food security status, health-related quality of life (HRQOL) and body weight status of adolescents in Mentakab, Pahang, Malaysia. **Methods:** This study involved 160 households that comprised pairs of mothers and children aged 13-17 years. Face-to-face interviews were conducted with the mothers to assess their demographic and food security status (Radimer/Cornell Hunger and Food Insecurity Instrument). Meanwhile, the children answered a self-administered HRQOL questionnaire (Pediatric Quality of Life Inventory, PedsQL). Body weight and height were measured to obtain the body mass index (BMI). **Results:** About 48.8% of the adolescents were from households with food insecurity. The number of school-going siblings, occupation status of mother, occupation status of father, household income and house ownership status were predictors of food security status ($p < 0.05$). After controlling for covariates, the HRQOL score and BMI were higher in adolescents from food-secure households than adolescents from food-insecure households ($p < 0.01$). **Conclusion:** The prevalence of food insecurity was high and multifactorial. Food insecurity was further associated with HRQOL and BMI. Food assistance programmes are recommended to directly alleviate food insecurity. Concurrently, monetary and educational aids are advocated to reduce the economic burden, especially in low-income households.

Keywords: Adolescents, food insecurity, health-related quality of life, Malaysia

INTRODUCTION

Adolescence is the second most rapid phase of human growth. It is a period of life with specific health and developmental needs. Adolescent is defined as any person aged 10-19 years. However, the age range has been extended to between 10 and 24 years because it corresponds more closely to adolescent growth

(Sawyer *et al.*, 2018). Nutrition plays an important role in fulfilling the energy and nutrient requirements for growth and bodily functions in adolescents (Das *et al.*, 2017). Therefore, food security is crucial to sustain active and healthy lives. According to the World Food Summit, food security occurs when all people at all times have physical and

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economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for active and healthy lives (WHO, 2012).

The prevalence of food insecurity varies among adolescents. Previous studies have found that about 70% of Mexican children and adolescents experienced some degree of food insecurity (Rodriguez *et al.*, 2017). The prevalence of food insecurity among Korean middle school adolescents (12-14 years old) and Korean high school adolescents (15-18 years old) were 11.1% and 16.8%, respectively (Nakitto *et al.*, 2017). A local study done by Roselawati *et al.* (2017) reported that the prevalence of food insecurity among adolescents aged 7-13 years in Kuantan, Pahang was 77.0%. The prevalence was higher among those from the low socio-economic status.

The literature has reported several demographic factors that affect food insecurity. Low income is the main predictor of food insecurity (Mohamadpour, Sharif & Keysami, 2012; Wang *et al.*, 2015; Roselawati *et al.*, 2017). Low income contributes to the inability to provide adequate basic needs (such as food) for the household members. Further, large numbers of school-going children in a household are associated with food insecurity because clothing, footwear, books, and pocket money for school-goers contribute significantly to the expenditure of the household (Norhasmah *et al.*, 2011). Likewise, residents of rented accommodation units are more likely to be food-insecure than those who live in their own houses. This is because rent payments limit the monetary resources (Sriram & Tarasuk, 2016). Demographic and socio-economic factors are risk factors of food insecurity.

Food insecurity has been associated with many undesirable consequences, including poor nutritional status (Norhasmah *et al.*, 2011; Nakitto *et al.*,

2017) and poor academic performance (Belachew *et al.*, 2011). Food-insecure children were three times more likely to be stunted and two times to be underweight as compared to food-secure children (Naser *et al.*, 2014). This might be due to the lower frequency of daily meal intake. Adolescents from poor were less likely to have breakfast than those from high and middle socio-economic backgrounds (Crawford *et al.*, 2015). School absenteeism rates were shown to be significantly higher in food-insecure primary school adolescents than those from food-secure in Ethiopia (Tamiru *et al.*, 2016). Food-insecure adolescents were probably unable attend school because of illness and/or lack of access to food.

In Malaysia, little is known about food insecurity and the health-related quality of life (HRQOL) among adolescents. To the best of our knowledge, there has been no local study on the association between food security and HRQOL in adolescents; there was only one study conducted on food security and HRQOL in women (Ihab *et al.*, 2012). Only one local study on food-insecurity and nutritional status among children aged 7-13 years has been identified (Roselawati *et al.*, 2017). Although numerous studies have examined the contribution of food security to body weight status, the findings on the association between food insecurity and body weight status was inconsistent. Therefore, this study of adolescents was aimed at (i) determining if there was an association between demographic factors and food security status, and (ii) at examining the differences in HRQOL and body mass index (BMI) based on food security status.

MATERIALS AND METHODS

This cross-sectional study was carried out in Mentakab, which is one of the

sub-districts of the Temerloh district in the state of Pahang in Peninsular Malaysia. A list of residential areas in Mentakab was obtained from the Municipal Council of Temerloh, Pahang. Mentakab was chosen due to its larger population and household counts in the said list as compared to other sub-districts. Based on the list, *Kampung Penak* was chosen as the study location because it had the largest residential areas. There were three residential areas in *Kampung Penak*, namely the traditional village of *Kampung Penak*, *Taman Sri Penak*, and *Taman Penak Perdana*. Quota sampling was applied whereby the sampling ratio was 2:4:4. The village of *Kampung Penak* had 100 households while *Taman Sri Penak* and *Taman Penak Perdana* had around 300 households each; 32 households (20%) from the traditional village, as well as 64 households (40%) from each of *Taman Sri Penak* and *Taman Penak Perdana* were recruited into this study.

The total sample size was determined using the G*power 3.1.9.2 software (Faul *et al.*, 2007). The odds ratio (OR) was obtained from Tamiru *et al.* (2016), who had found that household food insecurity increased the odds of absenteeism by 2.81 times. The calculated minimum sample size was 133 respondents. After adding 20% to the minimum sample size to account for drop-outs, it was decided to increase the sample size to 160 respondents. The mothers with their children (the latter aged 13-17 years) were recruited in pairs. Mothers with hearing problems or mutism and physically disabled adolescents were excluded.

Ethical approval for this study was obtained from the Ethics Committee for Research Involving Human Subjects, Universiti Putra Malaysia (JKEUPM). Written consent was obtained from the respondents prior to data collection.

Independent variables

A questionnaire, which contained questions on demographic background, food security status and HRQOL, was used to collect data. The demographic background and food security status parts were answered by the mother, while the HRQOL of the adolescents part was answered by the adolescents themselves. Demographic background questions were on the child's age, child's sex, mother's age, ethnicity, marital status (of caregiver or parents), household size, number of siblings, number of school-going siblings, household income, per capita income, parental occupation status, parental education level and house ownership status.

Food security status was assessed using the Radimer/Cornell Hunger and Food Insecurity Instrument. This section contained ten items that measured the levels or severity of food insecurity, namely, food security, household food insecurity, individual or adult food insecurity and child hunger. The answers were considered to be positive if the responses were either "sometimes true" or "often true". Conversely, "not true" answers reflected negative responses. The households were categorised as food-secure when there were negative answers to all hunger and food insecurity items. Positive answers to one or more household item(s) (1-4) defined household food insecurity. Meanwhile, positive answers to one or more items concerning the adults (5-7) or items on the quality of children's diet (8) – in addition to negative answers to the items on the quantity of children's intake (9-10) – denoted individual food insecurity. Positive answers to the items on the children's quantity of food intake (9-10) indicated child hunger.

Dependent variables

The Pediatric Quality of Life Inventory (PedsQL) version 4.0 Generic Core

Scales was used to measure the HRQOL of adolescents. The PedsQL consisted of 23 items with four different subscales, namely physical, emotional, social, and school functions. The items were rated based on a five-point Likert scale that ranged from 0 (never) to 4 (almost always). In terms of scoring, the items were reverse-scored and could be linearly transformed into a 0-100 scale. Therefore, higher scores indicated better HRQOL. The reverse items were transformed to 0-100 as follows: 0=100, 1=75, 2=50, 3=25, and 4=0.

The BMI of the adolescents was assessed by measuring their body weight and height. Body weight was measured by using the calibrated TANITA weighing scale and height by using the stadiometer mobile height (Seca 206). All measurements were taken three times to obtain the average reading. The BMI was calculated by dividing the body weight with the height square.

Data analysis

Data were analysed by using IBM's Statistical Package for Social Sciences (SPSS) version 20 and the Anthroplus WHO software was used particularly to determine the category of the BMI among adolescents. Descriptive analysis included percentages and frequencies for categorical data. Means and standard deviations were used to describe the continuous data. Binary logistic regression was used to determine the demographic predictors of the food security status. After controlling the covariates, a general linear model (GLM) was used to determine the differences in the HRQOL scores and BMI based on the food security status. In the GLM analysis, food security status was grouped into two groups namely food secure and food insecure. The covariates were determined based on the presence of significant relationships between the demographic factors with HRQOL and

BMI. The level of significance was set at $p < 0.05$.

RESULTS

Demographic background, food security status, HRQOL and BMI

The mean \pm SD age of the adolescents was 14.9 \pm 1.4 years, with 61.2% of them aged 13-15 years (Table 1). The mean maternal age was 40.4 \pm 4.5 years, with half of the mothers (51.8%) in the range of 30-39 years. Over half (59.5%) of the mothers and 15.0% of the fathers were unemployed. The mean household size, number of children, and school-going children of the households were 5 \pm 1, 3 \pm 1, and 3 \pm 1, respectively. Over half of the respondents (53.1%) lived in rented units. The mean monthly household and per capita incomes were RM2363 \pm 1102 and RM467 \pm 305.66, respectively.

The prevalence of food insecurity in this study was 48.8%. This figure encompassed 20.0% who had household food insecurity, 13.8% individual food insecurity and 15.0% child hunger. Based on Radimer/Cornell hunger scale, food security status could be divided into four categories namely food secure, household food insecure, individual food insecure and child hunger. Household food insecurity was related to food supply management and acquisition issue, while individual food insecurity was related to food consumption issues and the physiological sensation of hunger. Child hunger was the most severe household food insecurity problem and it was characterised by a decrease in the quantity of food consumed by the children. Child hunger only occurs after adults in the household and quality of the children's diet had been affected by household food insufficiency. The total mean HRQOL score among the adolescents was 61.29 \pm 18.08, with the highest mean score noted in emotional functioning (64.03 \pm 22.55) and the lowest

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Table 1. Characteristics of the adolescent participants in this study

<i>Characteristics</i>	<i>n</i>	<i>%</i>	<i>Mean±SD</i>
Age (Years)			14.9±1.4
13-15	98	61.2	
16-17	62	38.8	
Sex			
Male	85	53.1	
Female	75	46.9	
Ethnicity			
Bumiputera	124	77.4	
Non-Bumiputera	36	22.6	
Mother's Age (Years)			40.4±4.5
30-39	83	51.8	
40-49	70	43.8	
≥50	7	4.4	
Mother's educational level (Years)			10.19±3.67
No formal education	5	3.0	
Primary education	31	19.4	
Secondary education	56	35.0	
Tertiary education	68	42.6	
Father's educational level (Years)			12.96±2.83
No formal education	2	1.2	
Primary education	2	1.2	
Secondary education	50	31.3	
Tertiary education	106	66.3	
Mother's occupation status			
Housewife/unemployed	95	59.4	
Private	17	10.6	
Government	20	12.5	
Self-employed	28	17.5	
Father's occupation status			
Unemployed	24	15.0	
Private	39	24.3	
Government	30	18.8	
Self-employed	67	41.9	
Parents Marital Status			
Married	135	84.4	
Non-married	25	15.6	
Household size			5±1
1-5	79	49.4	
6-10	80	50.0	
≥11	1	0.6	
Number of siblings			3±1
1-3	70	43.8	
4-6	78	48.8	
≥7	12	7.4	
Number of school-going siblings			3±1
1-2	51	31.9	
3-4	96	60.0	
≥5	13	8.1	

Characteristics	n	%	Mean±SD
House ownership status			
Own	75	46.9	
Rented	85	53.1	
Household income (RM)			2363.13±1102.70
<1500	59	36.9	
≥1500	101	63.1	
Income per capita (RM) [†]			467.00±305.66
≤210	33	20.6	
>210	126	79.4	
Food Security Status			
Food secure	82	51.2	
Household food insecurity	32	20.0	
Individual food insecurity	22	13.8	
Child hunger	24	15.0	
Body Mass Index (BMI)			20.01±3.14
Severely thin	1	0.6	
Thin	6	3.8	
Normal	126	78.8	
Overweight	22	13.8	
Obese	5	3.1	
HRQOL			61.29±18.08
Physical functioning			58.81±21.13
Emotional functioning			64.03±22.55
Social functioning			61.69±21.50
School functioning			62.13±22.36

[†] Per capita income poverty line in Malaysia is RM210 and below

mean score in physical functioning (58.81±21.13). The total mean BMI was 20.01±3.14 kg/m² and 4.4% of them were categorised as thin and severely thin. The prevalence of the overweight and obesity among the adolescents was 16.9%.

Predictors of food security status

In the adjusted analysis, the factors that remained significantly associated with food security status were household income, number of school going children, occupation status of the parents and house ownership status ($p<0.05$)(Table 2). Adolescents from households with an income of below RM1500 were 12.6 times more likely to fall into the food insecure group than those who came from where the household income was RM1500 and above (AOR=12.626, 95%

CI: 2.681, 59.458). Adolescents who had ≥4 school going siblings increased the odds of being food insecure by tenfold than adolescents who had <4 school going siblings (AOR=10.726, 95% CI: 1.241, 92.714). Furthermore, unemployed parents were 22 times more likely to experience food insecurity than parents who were in employment ($p<0.05$). Living in rented property was 18 times more likely to result in food insecurity compared to those living in their own (AOR=18.093, 95% CI: 3.770, 86.848). A household income of below than RM1500, with >3 school-goers in the household, unemployed parents and living in a rent house were the predictors of food insecurity and contributed 63.5% to 84.7% of the variance in food insecurity.

Table 2. Demographic factors and food security status ($n=160$)

Variables	Adjusted OR (95% CI)	<i>p</i>
Household income (RM)		0.001**
<RM1500	12.626 (2.681, 59.458)	
≥RM1500	Ref (1.00)	
Number of school-going children		0.031*
≤3	(1.00)	
≥4	10.726 (1.241, 92.714)	
Occupational status of mother		0.001**
Employed	Ref (1.00)	
Unemployed	22.221 (3.540, 139.473)	
Occupational status of father		0.012*
Employed	Ref (1.00)	
Unemployed	22.354 (1.969, 253.479)	
Household size		0.051
1-5	Ref (1.00)	
≥6	8.391 (0.995, 70.789)	
House ownership status		0.000**
Own	Ref (1.00)	
Rented	18.093 (3.770, 86.848)	

*Significant at $p<0.05$

**Significant at $p<0.01$

Cox & Snell $R^2=0.635$, Nagelkerke $R^2=0.847$

HRQOL scores based on food security status

The food-insecure group had significantly poorer HRQOL (42.13 ± 10.51) than the food-secure group (69.95 ± 7.50) after controlling for the covariates of maternal age, maternal and paternal years of schooling, household income, number of siblings, as well as number of school-going siblings ($F=59.842$, $p<0.001$) (Table 3). Similarly, the physical and psychosocial functioning scores were higher in the food-secure group than those in the food insecure group after controlling for the same covariates ($p<0.001$).

BMI based on food security status

Adolescents from food-insecure households had significant lower BMI (18.68 ± 2.01 kg/m²) than adolescents from food-secure households (21.28 ± 3.50 kg/m²), after controlling for demographic background factors,

namely, monthly income, income per capita, number of children, years of schooling of mothers and fathers ($F=18.141$, $p<0.001$) (Table 3).

DISCUSSION

The prevalence of household food insecurity in this study was lower at 48.8% compared to the 77.0% shown in the earlier local study on children aged 7-13 years (Roselawati *et al.*, 2017). The study settings might explain the differences in the prevalence of food insecurity. The study by Roselawati *et al.* (2017) was conducted in Kuantan, Pahang which is categorised as urban area, while the current study took place in Mentakab, Pahang which is a rural area. Living in a rural area is associated with the low expenditure as the villagers cultivated home-grown vegetables and home-reared animals for food instead of buying from the markets (Roselawati

Table 3. HRQOL and BMI based on food security status after controlling the demographic factors

	Mean±SD		F-value	p-value
	Food security	Food insecurity		
HRQOL†	69.95±7.50	42.13±10.51	59.842	0.000*
Physical functioning	23.84±3.42	13.54±5.20	29.597	0.000*
Emotional functioning	15.32±3.30	10.17±4.10	12.543	0.001*
Social functioning	15.10±2.56	9.44±3.83	29.153	0.000*
School functioning	15.70±2.79	8.99±3.12	26.578	0.000*
BMI (kg/m ²)‡	21.28±3.50	18.68±2.01	18.141	0.000*

†GLM - adjusted for covariates - mother's age, years of schooling for mother, years of schooling for father, household income, number of sibling, and number of sibling going to school

‡GLM - adjusted for covariates - monthly income, income per capita, number of children, years of schooling of mother and father

* Significant at $p < 0.001$

et al., 2017). Furthermore, the costs for items such as house rental in rural area were lower than in an urban area leaving less money for foods (Sriram & Tarasuk, 2016). This may explain the lower prevalence of food insecurity that we found in our study.

This study has revealed that unemployment among the parents of adolescents was associated with food insecurity (Etana & Tolossa, 2017). Furthermore, this study has confirmed the outcomes of previous studies where low monthly incomes were associated with food insecurity (Norhasmah *et al.*, 2011; Mohamadpour *et al.*, 2012; Wang *et al.*, 2015). Unemployment and low incomes result in poverty and thus food insecurity (Etana & Tolosa, 2017). This situation was exacerbated by the large household size, the large number of siblings and school-going children, and occupancy of rented units which increase household expenditures and cause problems in the fulfillment of the food and non-food needs (Norhasmah *et al.*, 2011).

The total mean HRQOL score in this study (61.29±18.08) was lower than the study by Husna *et al.* (2013)

(78.50±13.48) that was done on secondary school adolescents in Kuala Lumpur. However, the setting of Husna *et al.* (2013) study was different from that of ours as it was conducted in the urban area of Kuala Lumpur. Living in rural settings negatively affects the physical HRQOL (Kurpas, Mroczek & Bielska, 2014). It might be due to the inadequate physical facilities in the rural areas and the consequent negative perception of their environment by the adolescents. Food insecurity was associated with physical functioning, as individuals in food-insecure households were more likely to report fair, poor, or very poor health statuses with activity limitations as compared to individuals in food-secure households (Ihab *et al.*, 2012; Chung *et al.*, 2016). It was previously shown that food insecure students were less likely to participate in strenuous physical activity and sport team (Shanafelt *et al.*, 2016). This may have been because food insecurity was associated with poor physical ability owing to poor nutritional status (i.e. deficiencies of essential nutrient and low-quality food intake) (Chung *et al.*, 2016). Therefore, physical functioning

among the adolescents in this study was lower among food-insecure group when compared with the food-secure group.

Food insecurity was associated with poor social and psychology functioning because the individuals from food insecure households were vulnerable to feelings of anxiety, helplessness, and loss of control besides having psychological impairment (Ihab *et al.*, 2012; Shanafelt *et al.*, 2016; Utter *et al.*, 2018). Furthermore, economic circumstances such as financial hardship could disrupt the emotional state of the mothers, which brought about the poor social and psychology functioning. In addition, food insecurity was found to be associated with poor functioning in school. This finding was consistent with that of a previous study (Shanafelt *et al.*, 2016) which documented that food-insecure students had lower grades or poor academic performance than food-secure students. Among the schooling children and adolescents, food insecurity was related with fewer family meals and skipping of breakfast. Breakfast has been reported to provide positive academic performance particularly in the memory and attention domains (Adolphus, Lawton & Dye, 2013). Inadequate nutrient intake among the food-insecure individuals could reduce normal brain function (Palar *et al.*, 2015).

In the context of the body weight status, the findings of this study contradicted that of the previous study of Roselawati *et al.* (2017), which found that there was no significant association between childhood obesity and food insecurity. The current study found that BMI was significantly lower in the food insecure group. Food insecurity was associated with inadequate food intake and low consumption of nutritious food (low intake of fruits and vegetables). Food insecure households might purchase low quality and quantity of food due to

the limited income (Mohamadpour *et al.*, 2012). Food-insecure individuals usually experienced skipping meals and consumed smaller portion sizes of meals which contributed to their low overall energy intake.

There were several limitations in this study. This was a cross-sectional study, so the cause-and-effect relationships could not be determined. Only an association could be established between the independent variables and dependent variables. Furthermore, this study did not explore other factors that were related to food security status. Instead, only demographic factors such as sex, ethnicity, parental education levels, parental occupation status, house ownership status, household size, number of school-going siblings, number of siblings, parental marital status and household income were included in this study. Besides, as this study merely focused on the adolescent population, the HRQOL findings could not be extrapolated to other populations such as the elderly.

CONCLUSION

In conclusion, nearly half of the households (48.8%) suffered from some degree of food insecurity. Having ≥ 4 school going children, unemployed parents and a household income of <RM1500 and living in a rented property were the main contributors of food insecurity. Furthermore, food insecurity was associated with poor HRQOL and low BMI. Food assistance programmes are recommended to alleviate the high prevalence of food insecurity. Monetary and school aids are also advocated to reduce the economic burden in households with low monthly incomes. Future local studies pertaining to the factors and consequences of food insecurity in adolescents are recommended.

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Authors' contributions

SA, conceptualised and designed the study, carried out the data collection and prepared the draft of the manuscript; NS, supervised the flow of the overall research and reviewed the manuscript; FMN and SFM assisted in the drafting and review of the manuscript.

Conflict of interest

The authors have no conflict of interest.

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