

Prevalence and Factors Influencing Fruit and Vegetable Consumption among Malaysian Elderly

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ABSTRACT

Background: Fruit and vegetable intake has multiple health benefits in preventing diet-related chronic diseases. The objective of this study was to determine the prevalence of inadequate daily fruit and vegetable consumption and its associated factors among the elderly in Malaysia.

Materials and Methods: Secondary data from the National Health Morbidity Survey 2011 in Malaysia was used for the statistical analysis. The elderly aged 60 years and above who were living in selected households were recruited into this study. Information on socio-demographic characteristics, fruit and vegetable consumption, self-rated health, and history of chronic diseases were obtained by trained research team members by face-to face interview. Descriptive analysis and complex sample logistic regression were used in data analysis.

Result: Respondents comprised of 51.5% females, 61.6% aged between 60 and 69 years old, and 67.9% were married. Half of the respondents (50.0%) ever attended to primary school and more than half of them were living in the urban area (65.0%). This study revealed that 81.9%, 87.6%, and 91.9% of elderly people did not consume adequate fruit, vegetable and combination of fruit and vegetable respectively. Complex sample logistic regression analysis showed that education level, moderate self-rated health status, and being single were significantly associated with inadequate fruit and vegetable consumption.

Conclusion: Majority of the elderly did not consume adequate fruit and vegetable per day. Therefore, a nutrition policy to encourage healthy eating practices among the elderly in the health facilities of the Ministry of Health Malaysia is recommended to promote the health benefits of consuming fruit and vegetable.

Keywords: fruit and vegetable intake, older people, socio-demography, dietary practices, healthy eating

1.0 Introduction

Many studies have found the health benefits of fruit and vegetable consumption among the elderly population worldwide (Lee et al., 2010; Gibson et al., 2012; Nicklett et al., 2012). For example, a higher intake of fruit and vegetable is associated with reduced risk of having obesity, coronary heart disease, hypertension, and cancer (Wang et al. 2012). Besides, previous research has also found that higher fruit and vegetable intake among elderly is a protective factor in cognitive decline, for instance Alzheimer's disease and dementia (Chen et al. 2012).

Although fruit and vegetable consumption is well studied as a protective factor of chronic diseases and cancers among elderly population (Carter et al, 2010), less than half of elderly men and women from previous studies achieved the recommended servings of fruit and vegetable intake per day (Peltzer & Phaswana-Mafuya, 2012; Sabzghabae, et al, 2010). There were a sample of Brazilian elderly even did not consume any type of fruit and vegetable on a daily basis (Viebig et al, 2009).

The elderly are at risk for inadequate fruit and vegetable consumption due to many factors. Normally, elderly are facing more challenges in obtaining and preparing fruit and vegetable in their daily life such as loss of chewing ability, not able to travel to markets for purchasing fresh fruit and vegetable, and lack of knowledge of recommendations (Haynes-Maslow et al, 2013; Appleton et al, 2009). In Malaysia, a national representative study to identify the factors associated with inadequate fruit and vegetable consumption among elderly in Malaysia is still lacking. This study aims to determine the prevalence of inadequate daily fruit and vegetable consumption and to investigate the it's associated factors among elderly population in Malaysia.

2.0 Materials and Methods

2.1 Sample and Procedures

Data of this study were obtained from the National Health and Morbidity Survey 2011 (NHMS 2011) (Institute for Public Health, 2011). NHMS 2011 is a nationwide cross-sectional study which conducted in year 2011. A two-stage random sampling design was used to select a representative sample of Malaysian adults aged 18 and above (Institute for Public Health, 2011). Sampling selection was based on living areas from 16 states in Malaysia. Malaysian living areas were divided into enumeration blocks (EB). First stage sampling was randomly selection of EB in proportion to the adult population. Second stage sampling was the selection of 12 living quarters (LQ) from the selected EB. Individuals aged 18 years and above in the selected household were eligible to participate in NHMS 2011. Respondents aged 60 years and above who responded to the questions regarding fruit and vegetable consumption and socio-demographic characteristics were included in the statistical analyses. Ethical approval of this study was obtained from the Medical Research Ethics Committee of the Ministry of Health, Malaysia.

2.2 Instruments

A set of face-to-face interview questionnaire was designed to assess the information of socio-demographic characteristics, fruit and vegetable consumption, and history of chronic diseases. Information was collected as below:

1. Socio-demographic characteristics information included age, gender, current marital status, education level, and residential area.
2. Daily fruit consumption was measured using two questions: "In a typical week, how many days do you eat fruit?" and "Usually on the day that you eat fruit, how much did you eat?" Similar questions were asked to assess vegetable consumption: "In a typical week, how many days do you eat vegetable?" and "Usually on the day that you eat vegetable, how much did you eat?" A food album, consisting of pictures of food items according to food groups was shown by trained interviewer during the interview session to estimate the amount of fruit and vegetable being consumed by the respondents.

The number of servings of vegetable and fruit reported by the respondents were calculated by multiplying the frequency of intake in a week by the amount consumed in a typical day and then dividing by seven in order to obtain the number of daily consumption. Inadequate daily fruit, vegetable, and combination of fruit and vegetable consumption were defined as less than two servings, less than three servings and less than five servings for combination, respectively (World Health Organization, 2003).

3. Self-report history of chronic diseases including diabetes mellitus, hypertension, and hypercholesterolemia were also assessed. Self-rated health status was assessed based on Likert scale (very good or good, moderate, bad or very bad).

2.3 Data Analysis

Data were analyzed using SPSS for Window version 22.0 (IBM, New York, US). Data was weighted to take into consideration of the complex sampling design and non-response rate. Descriptive statistic was used to describe the respondents' characteristics. Chi-square analysis was performed to assess the association between socio-demographic factors, self-rated health status, and history of chronic diseases with fruit and vegetable consumption. All variables at the p-value <0.05 level in univariate analyses were included into complex sample logistic regression analysis. All statistical analysis was run at 95% confidence interval.

3.0 Result

In total, 2,752 elderly completed the questionnaires with an overall response rate of 99.6%. Almost 60% of the respondents aged between 60-69 years and 67.9% of them were married. Nearly one-quarter of them (26.3%) never attend any formal education. In addition, more than half of the respondents lived in urban area (65.0%) and reported good self-rated health status (69.4%) and majority of them have no history of chronic diseases.

Table 1: Socio-demographic characteristics of respondents

Socio-demographic characteristics	Unweighted count, n	% (95% CI)
Age		
60-69	1670	61.6 (59.0-64.1)
70-79	842	29.2 (26.9-31.6)
≥ 80	252	9.2 (7.9-10.8)
Gender		
Male	1286	48.5 (46.4-50.5)
Female	1478	51.5 (49.5-53.6)
Marital status		
Single	51	2.0 (1.4-2.7)
Married	1825	67.9 (65.4-70.2)
Widowed /Divorced	887	30.2 (27.9-32.6)
Education level		
Without formal education	814	26.3 (24.3-28.4)
Primary school	1369	50.0 (47.4-52.6)
Secondary school	418	18.3 (10.1-20.7)
Tertiary	118	5.5 (4.3-6.8)
Residential area		
Urban	1386	65.0 (62.7-67.3)
Rural	1378	35.0 (32.7-37.3)
Self-rated health		
Very good/good	1884	69.4 (67.1-71.6)
Moderate	768	26.7 (24.6-28.8)
Bad/very bad	108	3.9 (3.1-5.0)
History of diabetes		
Yes	627	22.4 (20.4-24.6)
No	2080	77.6 (75.4-79.6)
History of hypertension		
Yes	1085	39.7 (37.3-42.1)
No	1661	60.3 (57.9-62.7)
History of hypercholesterolemia		
Yes	541	21.9 (19.8-24.2)
No	2183	78.1 (75.8-80.2)
Daily consumption (serving)		
		mean ± SE
Fruit	2761	0.89 ± 0.02
Vegetable	2754	1.57 ± 0.02
Fruit and vegetable	2752	2.51 ± 0.40

Table 2 shows that the overall prevalence of inadequate fruit, vegetable, and combination of fruit and vegetable consumption were 81.9%, 87.6%, and 91.9%, respectively. The prevalence of inadequate combination of fruit and vegetable consumption were higher among the oldest aged group (≥ 80 years), women, widowers/divorcees, lower educated groups, those lived in rural area, and those with poorer self-rated health status. In chi-square analysis, age, marital

status, education level, residential area, and self-rated health status were significantly associated with inadequate combination of fruit and vegetable consumption ($p < 0.05$).

Table 3 illustrated the associations between socio-demographic factors and fruit and vegetable consumption. The significant associated factors for fruit and vegetable consumption were education level [without formal education [aOR= 13.24 (6.70-26.17)], primary school [aOR= 4.65 (95% CI: 2.57-8.39)], and secondary school [aOR= 2.48 (95% CI: 1.33-4.60)], moderate self-rated health [aOR= 1.67 (95% CI: 1.08-2.58)] and single marital status [aOR = 0.40(95% CI:0.16-0.97)].

Table 2: Prevalence of inadequate daily fruit, vegetable, fruit and vegetable consumption by socio-demographic factors

Socio-demography Variables	Inadequate consumption					
	Fruit (< 2 servings)		Vegetable (< 3 servings)		Fruit & vegetable (< 5 servings)	
	% (95% CI)	p	% (95% CI)	p	% (95% CI)	p
Study population	81.9 (79.8-83.9)		87.6 (85.9-89.1)		91.9 (90.4-93.1)	
Age		0.003		0.001		< 0.001
60-69	79.5 (76.7-82.1)		85.5 (83.2-87.5)		89.9 (87.8-91.7)	
70-79	84.6 (80.5-88.0)		89.8 (86.5-92.4)		94.5 (92.0-96.2)	
≥ 80	89.5 (84.4-93.2)		94.7 (91.1-96.9)		96.5 (93.3-98.2)	
Gender		0.016		0.573		0.056
Male	79.7 (76.5-82.5)		87.1 (84.5-89.4)		90.6 (88.3-92.5)	
Female	84.1 (81.5-86.4)		88.0 (85.5-89.9)		93.0 (91.2-94.5)	
Marital status		0.425		0.115		
Single	76.5 (59.3-87.9)		78.6 (61.6-89.4)		80.8 (63.7-91.0)	0.003
Married	81.3 (78.7-83.7)		87.0 (84.8-89.0)		91.0 (89.0-92.7)	
Widowed	83.6 (79.7-86.9)		89.4 (86.5-91.7)		94.4 (92.4-96.0)	
/Divorced						
Education level		<0.001		0.002		< 0.001
Without formal education	91.2 (88.7-93.2)		91.5(88.8-93.6)		97.7 (96.5-98.5)	
Primary school	83.3 (80.3-85.9)		87.0 (84.8-89.5)		92.8 (90.8-94.4)	
Secondary school	74.9 (68.8-80.1)		86.1 (81.4-89.8)		86.0 (81.1-89.8)	
Tertiary	45.3 (34.0-57.1)		77.6 (67.4-85.4)		73.0 (62.5-81.3)	
Residential area		<0.001		0.947		0.013
Urban	78.6 (75.5-81.4)		87.6 (85.2-89.6)		90.7 (88.6-92.5)	
Rural	88.1 (85.9-90.0)		87.7 (85.-89.7)		93.9 (92.1-95.3)	
Self-rated health		<0.001		0.248		0.001
Very good/good	79.2 (76.5-81.7)		86.7 (84.88.86)		90.4 (88.4-92.1)	
Moderate	87.5 (84.0-90.4)		89.7 (86.8-92.0)		94.8 (92.6-96.4)	

Bad/very bad	93.9 (86.5-97.4)	89.0 (77.6-95.0)	96.9 (91.3-98.9)	
History of diabetes		0.638	0.739	0.450
Yes	82.8 (77.8-86.9)	88.2 (84.6-91.0)	91.7 (90.0-93.2)	
No	81.6 (79.2-83.8)	87.5 (85.5-89.3)	92.9 (89.9-95.1)	
History of hypertension		0.013	0.472	
Yes	84.9 (81.8-87.5)	88.3 (85.7-90.5)	91.7 (89.9-93.3)	0.701
No	80.0 (77.1-82.5)	87.2 (84.9-89.1)	92.2 (89.9-94.0)	
History of hypercholesterolemia		0.537	0.323	0.964
Yes	80.6 (75.4-84.9)	89.2 (85.5-92.0)	91.8 (90.2-93.2)	
No	82.1 (79.8-83.8)	87.2 (85.2-88.9)	91.9 (88.2-94.5)	

p = p-value

Table 3: Adjusted odd ratios (aOR) and 95% confident interval of factors associated with inadequate daily fruit, vegetable, and fruit and vegetable consumption

Socio-demographic Variables	Fruit	Vegetable	Fruit and vegetable
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Age			
60-69	1.00	1.00	1.00
70-79	1.08 (0.75-1.56)	1.34 (0.92-1.94)	1.37 (0.84-2.21)
≥ 80	1.32 (0.78-2.23)	2.68 (1.44-5.00)*	1.76 (0.81-3.82)
Gender			
Male	1.02 (0.77-1.35)	-	-
Female	1.00	-	-
Marital status			
Single	-	-	0.40 (0.16-0.97)*
Married	-	-	1.00
Widowed /Divorced	-	-	0.97 (0.61-1.53)
Education level			
Without formal education	8.80 (4.87-15.90)*	2.56 (1.36-4.81)*	13.24 (6.70-26.17)*
Primary school	4.98 (2.93-8.46)*	1.88 (1.07-3.30)*	4.65 (2.57-8.39)*
Secondary school	3.28 (1.89-5.70)*	1.81 (0.95-3.44)	2.48 (1.33-4.60)*
Tertiary	1.00	1.00	1.00
Residential area			
Urban	1.00	-	1.00
Rural	1.49 (1.13-1.96)*	-	1.01 (0.69-1.48)
Self-rated health			
Very good/good	1.00	-	1.00
Moderate	1.55 (1.10-2.18)*	-	1.67 (1.08-2.58)*
Bad/very bad	2.92 (1.17-7.30)*	-	2.01 (0.66- 6.13)

History of diabetes			
Yes	-	-	-
No	-	-	-
History of hypertension			
Yes	1.27 (0.95-1.69)	-	-
No	1.00	-	-
History of hypercholesterolemia			
Yes	-	-	-
No	-	-	-

* significant association ($aOR > 1$)

reference category = ≥ 2 servings of fruit, ≥ 3 servings of vegetable, and ≥ 5 servings of fruit and vegetable

4.0 Discussion

In this study, almost all of the respondents (91.9%) did not achieve the World Health Organization (World Health Organization, 2013) recommendations of at least five servings of fruit and vegetable consumption in a day. In addition, the prevalence of inadequate fruit and vegetable consumption among Malaysian elderly is higher than several developed and developing countries including Canada (53.0%), China (62.0%), and South Africa (68.5%) (Riediger & Moghadasian, 2008; Li et al., 2012; Peltzer & Phaswana-Mafuya, 2012). Although there are variety of tropical fruit and vegetable available in the markets, retailed stores or stalls in Malaysia, we found a very small proportion of elderly consume adequate amount of fruit and vegetable.

This study reveals that elderly from aged 80 years old and above are more likely to consume inadequate vegetable. Our findings are consistent with previous studies in China and Iran, which also found that increasing age was a risk factor for inadequate fruit and vegetable consumption especially for vegetable intake (Li et al., 2012; Salehi et al., 2010). Inadequate consumption of almost all types of vegetable among older aged elderly maybe due to tooth loss problem (Brennan et al., 2010). Tooth loss problem is very common among Malaysian elderly, majority of the elderly were edentulous in Kelantan state (81.0%) (Ka et al., 2007). In addition, a nation-wide study found that there was a marked increase of edentulism among Malaysian adults as early as age 45-54 years old (Oral Health Division, 2004). Therefore, the probability of loss of chewing ability for vegetable among older aged elderly in Malaysia is higher than the younger adults.

The findings show that the single elderly are significantly less likely to consume inadequate fruit and vegetable as compared to the elderly who are married. This finding is inconsistent with previous studies. Evidence showed that the presence of companionship or eating meals together with a partner in the household is associated with higher consumption of fruit and vegetable (Nicklett & Kadell, 2013; Riediger & Moghadasian, 2008). In our study, majority of our single elderly were women and from the younger age group (60-69 years old) who may be able to access or eat fruit and vegetable with less barriers than the older aged elderly. In

addition, single elderly women were more influenced by body image and more concern on their health status and led them eat more healthy food than men (Donkin et al., 1998). There is still insufficient data from this survey to further investigate the role of marital status on fruit and vegetable consumption among the elderly in Malaysia. Therefore, it is necessary to further explore the impact of marital status on fruit and vegetable consumption behaviors.

Education is identified as an important associated factor of inadequate fruit and vegetable consumption in this study. This finding is consistent with the previous studies (Riediger & Moghadasian, 2008; Salehi et al., 2010; Li et al., 2012). The impact of education could be mediated by health literacy as health literacy is the crucial element for healthy eating (Von Wagner et al, 2007a). Elderly with lower education achievement are more likely to have lower health literacy and less awareness of important of healthy eating practices and overall health status (von Wagner et al., 2007b; Nicklett & Kadell, 2013). In addition, elderly with higher education achievement usually earning higher income and be more affordable to spend on healthy food (Riediger & Moghadasian, 2008). In future study, it could be a need to explore the association between health literacy and healthy eating behaviours among Malaysian elderly.

This study shows that elderly who live in rural area are significantly more likely to consume inadequate fruit. This findings is in line with a previous Malaysian study which revealed that majority of elderly in rural areas have unsatisfactory nutritional knowledge to eat balance diet (Adznam et al., 2009). Another previous Malaysian study found that the dietary patterns of elderly in rural areas remained traditional in the last decade (Shahar et al., 2000). Food beliefs about fruit and vegetable as cool, hot, windy or sharp, which could cause joint pain or numbness, poor blood circulation, gastrointestinal discomfort, asthma, and heart burn caused 49.0% of Malaysian elderly in rural area to commonly avoid consuming fruit and vegetable (Shahar et al., 2000).

In our study, those who reported lower self-rated health status (moderate or bad) are significantly more likely to consume inadequate fruit. Besides, those with moderated self-rated health status are also significantly more likely to consume inadequate both fruit and vegetable as compared to those reported good self-rated health status. There is evidence to show that an increase of about 10% in the odds of reporting good or better self-rated health status was associated with an additional serving of fruit and vegetable (Sodergren et al., 2012). Therefore, the elderly with better self-rated health status may feel more satisfied in adapting healthy lifestyle behaviours and are more likely to be aware of recommended fruit and vegetable amounts.

According to the findings, having a history of chronic diseases (diabetes, hypertension, and hypercholesterolemia) is not significantly associated with inadequate fruit and vegetable consumption. Our data is partial supported by a previous study which revealed that Malaysian adults with hypercholesterolemia were more likely to consume more fruit and vegetable but adults with hypertension did not consume more fruit and vegetable. (Yen et al., 2011). Furthermore, Malaysian adults with diabetes were even less likely to consume more servings of fruit and vegetable compared to non-diabetic adults (Yen et al., 2011). Malaysian elderly may not aware of the health benefits of consuming more fruit and vegetable. Implementation of nutrition education programs among the elderly with non-communicable chronic diseases is recommended to promote healthy eating behaviour in order to improve their overall well being.

There are several limitations of this study. First, this is a cross-sectional study which does not allow a causal relationship between fruit and vegetable consumption and socio-demographic factors. Secondly, self-reported data may have recall bias due to under-reporting or over-reporting. This study only estimated the number of servings of fruit and vegetable being consumed. Details about the type and variety of fruit and vegetable which were commonly consumed by the Malaysian elderly population were not determined.

5.0 Conclusion and recommendation

The prevalence of inadequate fruit and vegetable consumption among the Malaysian elderly is high. Respondents who were single, with lower education level, lower self-rated health status were more likely to consume inadequate fruit and vegetable. In addition, respondents who lived in rural area were more likely to consume inadequate fruit and respondents aged 80 years old and above were more likely to consume inadequate vegetable. Nutrition education and other healthy eating promotion activities are suggested to increase the awareness of fruit and vegetable consumption among the elderly as well as their care givers. Greater effort in collaboration with other government agencies as well as non-government organization is needed to disseminate healthy food choices information and provide supporting environment among elderly to consume more fruit and vegetable.

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Declaration

This manuscript has not been published elsewhere and is not submitted simultaneously for publication elsewhere.

Authors contribution

Author 1: design the outline of the manuscript and prepare and edit the manuscript

Author 2: design the outline of the manuscript and review the manuscript

Author 3: review the final manuscript

Author 4: review the final manuscript

Author 5: review the final manuscript

Author 6: review the final manuscript

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