ORIGINAL ARTICLE

Association between Socio-demographic Factors, Involvement Status in Gardening and Diet Quality among B40 Households in Taman Keramat, Kuala Lumpur

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ABSTRACT

Introduction: COVID-19 pandemic has impacted the livelihood of Malaysians and gardening activities have contributed positively to the diet quality. This study aimed to determine the factors associated with diet quality among adults in AU2 Keramat, Kuala Lumpur. **Methods:** The cross-sectional study involved adults aged 18 to 59 via convenience sampling. The socio-demographic, physical activity level and involvement status in gardening were obtained through a questionnaire, while food intake was from a single-day 24-hour diet recall. The diet quality was determined through Malaysian Healthy Eating Index (MHEI) and dietary misreporting was calculated using the Goldberg cut-off method. **Results:** A total of 117 respondents (65.8% females, 35.2% males) with a mean age of 40.98 were involved in this study. Findings showed that most respondents did not engage in gardening activities (72.6%) and the prevalence of poor diet quality in this study was 89.7%, with a mean score of 44.51. The older respondents (r= 0.20, p= 0.034) and community gardeners (t= -2.63, p= 0.011) had a significantly higher diet quality but not home gardeners (t= 0.12, p= 0.902). The respondents involved in gardening activity also had a significantly higher fruit serving intake, Mann-Whitney U= 1045.00, p= 0.036) and lower total fat intake (t= 2.27, p= 0.025). **Conclusion:** The diet quality of the respondents remains poor but community gardeners had significantly higher diet quality and fruit intake while lower total fat intake. Interventions need to be developed to address the persistent poor diet quality of adults in the community.
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INTRODUCTION

Diet quality has recently gained the attention of researchers and the public because the dietary-pattern approach has more significant health outcomes than isolated nutrient components (1). It reflects the consumption and nutritional composition of an individual (2). From 1990 to 2010, the diet quality of 187 countries revealed that healthful food intake improved, whereas unhealthy food items decreased with heterogeneous results in different countries (2). However, several low-income countries in Africa and Asia experienced worsened dietary patterns (2).

In Malaysia, no national study on diet quality has been conducted but a scoping review among different populations in Malaysia shows that those staying in rural areas and being in the indigenous group have poor diet quality. In contrast, those living in the urban area still need to improve their diet quality (3). In a nationwide cross-sectional survey, Mohamad Hasnan Ahmad et al. (4) discovered that the mean sodium intake of Malaysians was 2585.9mg per day which exceeded the recommendation of 2000 mg per day by the World Health Organization (WHO) (5). Similarly, Malaysians' intake of fruit, vegetable, legumes, and dairy products is insufficient but there is an excessive intake of meat, salt and sugar (3). If this situation persists with poor nutrients and essential food groups, the prevalence of non-communicable diseases will continue to rise among Malaysians.

Although the COVID-19 pandemic has accelerated the severity of food insecurity, unemployment, and mental health that influence the diet quality of the population,

gardening is deemed to be a holistic and sustainable solution to address these issues (6, 7). Looking back to Malaysia, Rezai et al. (8) highlighted the benefit of community gardening because it supplies adequate food, proper nutrition, cost-effective food supplies and decreases food bills. Both home gardening and community gardening are categorised under urban agriculture, where the former is managed by members of a household while the later is managed by members of a community (9, 10). It can function as a platform to educate the community, produce food for individual consumption or sales and beautify the community.

Urban Agriculture Division was established under the Department of Agriculture in Malaysia to support the urban agriculture programme by providing advisory services, technical consultancy and agricultural training. This division also plans, coordinates and monitors suitable activities and programmes for urban and rural areas (11). Since then, more than 50,000 individuals from 3,042 locations have participated in community gardening organised by the division through conventional or modern technology (12). Nevertheless, there is no proper documentation for the list of community gardens around Kuala Lumpur that could be found.

Diet quality, one of the determinants of health, is affected by various factors such as food security but gardening can be the enabling factor to improve health and well-being. Despite the various health benefits of diet quality, there are limited studies on the factors associated with diet quality in Malaysia among adults especially among the urban poor (3). There is also no study locally looking into the association between the involvement of gardening with diet quality. With the increased prevalence of non-communicable diseases among adults and the implications of the COVID-19 pandemic, diet quality and its associated factors become more prominent to be investigated. Hence this study aimed to investigate the association between socio-demographic factors and the involvement status of gardening with diet quality.

MATERIALS AND METHODS

Study design and sampling method

Google Maps was used and identified about 22 community gardens. Some identified areas are Taman Tun Dr Ismail, Bangsar, Sri Hartamas, Pandan Jaya and AU 2 Keramat. Rumah Pangsa AU 2 Taman Keramat, located in the east part of Kuala Lumpur, Malaysia and borders the district of Ampang in Selangor, was selected to conduct this cross-sectional study. The majority of the residents are of Malay ethnicity and have a financial status of B40 with more than 80% of the residents being 16 years old and above. The community garden was chosen because it is well-established in the community with various crops, including more than 20 species of fruits, vegetables and herbs. This community garden also houses a small plot of paddy plants, processes organic fertiliser and rears Holland rabbits, freshwater prawns, catfish and tilapia for consumption which are its unique traits compared to other community gardens in Kuala Lumpur.

Residents of Rumah Pangsa AU 2, Taman Keramat who are Malaysian aged 18 to 59 years old were invited to join the study. This study will exclude vegetarians, individuals who change food habits in the past six months for a specific purpose, lactating, pregnant and post-partum women and any individuals who have a physical disability that affects body movement. It is because those who changed their dietary habits, lactating, pregnant and post-partum women have different dietary requirements, while those with a physical disability might limit their involvement in community gardening. A total of 152 respondents were recruited through convenience sampling due to the restriction of the COVID-19 pandemic.

Ethics approval and consent to participate

This study obtained ethical approval from the Ethics Committee for Research involving Human Subjects of Universiti Putra Malaysia (JKEUPM-2021-334). An email application was sent to the committee secretary for Rumah Pangsa AU 2 Taman Keramat to obtain permission to conduct the study among the residents. Then, the written consent form was given to residents who fulfilled the inclusion criteria and consented to participate in the study.

Data collection

The data collection period was from 6th November to 28th November 2021. Visits to the households were accompanied by the committee of the residential area. The respondents who agreed and gave consent to participate in the study filled in a self-administered questionnaire in the Malay language on the socio-demographic background (age, sex, date of birth, ethnicity, religion, marital status, employment status, educational level, household size and monthly household income) and involvement status in gardening. If the respondents required assistance filling out the questionnaire, the researcher will read the questions to them and help them fill in the responses. Then, the researcher conducted a face-to-face interview and recorded the single-day 24-hour diet recall for the respondents.

Physical activity level

The Global Physical Activity Questionnaire (GPAQ), which was developed by WHO in 2002 (13), was used to evaluate the physical activity (PA) level of the respondents for the determination of dietary misreporting and energy requirement. There are 16 questions in total in GPAQ and it gathers information on physical activity participation in three domains that include activity at work, travels to and from places, recreational activities as well as sedentary behaviour (15). More information on GPAQ analysis was described elsewhere (14). The

level of physical activity was further classified into three categories (High, Moderate and Low) based on the total physical activity per week (MET-minute per week) in IPAQ guideline (15).

Dietary intake

The food intake of the respondents was determined through a single-day 24-hour dietary recall. Due to the COVID-19 pandemic and time constraints for the research period, a single-day 24-hour dietary recall was chosen. The data was collected via face-to-face interview and household measurements like spoon, scoop, bowl, plate, cup and glass will be used to assist the respondents in estimating the portion size of their food and drinks. To have better visualisation for more accurate estimation, Atlas of Food Exchanges and Portion Sizes (16) was used during the interview process. Respondents were required to recall what they had consumed and drunk in the past 24-hour including the mealtime, cooking methods, brand names and portion sizes. The recipe for unfamiliar dishes was asked and recorded for analysis.

Dietary misreporting

Dietary misreporting among the respondents was evaluated using the Goldberg cut-off method, the equation established by Goldberg et al. (17). The concept of this equation is based on the basis that the energy intake and energy expenditure should be the same when the weight remains constant (17). However, Black (18) restated the principles by introducing the values to be substituted into the equation after re-examining the physiological principles. The physical activity level (PAL) was considered when calculating dietary misreporting to increase the sensitivity of the Goldberg cut-off method. As stated by Black (2000) in his practical guide, the following equations were applied to derive the cut-offs for the evaluation of dietary misreporting:

$$EI:BMR > PAL \times \exp\left[s.d.\min \times \frac{(S/100)}{\sqrt{n}}\right]$$

and

$$EI:BMR < PAL \times \exp\left[s.d.\max \times \frac{(S/100)}{\sqrt{n}}\right]$$

The first equation is used to calculate the specific lower cut-off point to identify the under-reporters while the second equation is used to calculate the specific upper cut-off point to identify the over-reporters. In the above equations, s.d. min refers to the 95% lower confidence limit which is -2 and s.d. max refers to the 95% upper confidence limit which is +2. The misreporting at the individual level was identified using the value of n=1 in this study. In addition, the factor that needs to take account of the variation in energy intake, BMR and PAL were calculated through the formula below and denoted by S:

$$S = \sqrt{\frac{CV_{wEI}^2 + CV_{wB}^2 + CV_{tP}^2}{d}}$$

Where:

CV_{wEI} = within-respondent variation in energy intake

d= number of days of diet assessment

CV_{wB} = within-respondent variation in repeated BMR measurements

CV_{tP} = between-respondent variation in PAL

Based on the 1-day diet assessment, the following revised factor by (Black (2000) was applied:

CV_{wEI} = 23%; CV_{wB} =8.5%; CV_{tP} = 15%.

$S = \sqrt{23^2 + 8.5^2 + 15^2}$

$=28.7$

According to the age group and level of PAL for this study (19), the lower and upper cut-off points were 0.79-2.49 for low physical activity level, 0.90-2.84 for moderate physical activity level and 1.01-3.20 for vigorous physical activity level.

$$EI:BMR > PAL \times \exp\left[-2 \times \frac{(28.7/100)}{\sqrt{1}}\right]$$

and

$$EI:BMR < PAL \times \exp\left[2 \times \frac{(28.7/100)}{\sqrt{1}}\right]$$

Respondents with calculated EI: BMR falls under the lower cut-off point are classified as under-reporter while those on the upper cut-off point are classified as over-reporter. Respondents who had the calculated value between the cut-off points are classified as acceptable reporters. The prediction equation by Ismail et al. (20) was used to determine the BMR for each respondent.

Malaysian Healthy Eating Index Scoring

The overall diet quality of the respondents in this study was computed using the MHEI. The information and scoring on MHEI were described elsewhere (21). This instrument, consisting of seven components from the food groups and another two components from the nutrients, was developed by Lee et al. (22) and validated by Goh et al. (23). This scoring for serving size was adapted to the latest MDG 2020 to measure the diet quality of the respondents according to the latest guidelines (24). The scoring for fat and sodium, which are the nutrients components, are according to the 85 percentiles from the MANS 2003. Respondents who attained the serving sizes were given a maximum score of ten while respondents who did not consume the food groups were given a minimum score of zero and the score in between was calculated proportionally. All the nine components in the MHEI were listed in Table I and the

Table I: Criteria scoring for Malaysian Healthy Eating Index components

Components	Score range	Criteria for minimum score 0	Criteria for score 8	Criteria for maximum score 10
1. Rice, other cereals, wholegrain cereal-based products and tubers	0-10	0 serving		3 - 5 servings[a]
2. Fruits	0-10	0 serving		2 servings[a]
3. Vegetables	0-10	0 serving		≥ 3 servings[a]
4. Meat, poultry and egg	0-10	0 serving		1 - 2 servings[a]
5. Fish	0-10	0 serving		1 serving[a]
6. Legumes (combine bean, lentil and soy)	0-10	0 serving		1 serving[a]
7. Milk and milk products	0-10	0 serving		2 servings[a]
8. Total fat	0-10	≥ 35% energy from fat[b]		≤ 30% energy from fat[a]
9. Sodium	0-10	≥ 4200 mg[b]	2400 mg[a]	≤ 2000 mg[a]

[a]Based on Malaysian Dietary Guidelines (25)
[b]Based on 85 percentile from Malaysian Adult Nutrition Survey data (23)

scoring method was identified using the recommended serving size in MDG 2020. The maximum total score of all nine components under MHEI is 90. Then, the total score of all components acquired by each respondent was converted into a percentage. Hence, the composite score of MHEI is 100%, where poor diet was reflected by the score of less than 51%, diet requiring improvement was reflected by the score of 51% to 80%, and greater than 80% suggests a good diet (22).

Statistical analysis

Nutritionist Pro ® was used to analyse the data collected from MHEI scoring. Nutrient Composition of Malaysian Food (25) and ASEAN Food Composition Database (26) were used to determine the nutrient content of food that was not listed in Nutritionist Pro ®. Malaysian Dietary Guidelines (MDG) 2020 (24) was the primary guide while Atlas of Food Exchanges and Portion Sizes (16) and Guidelines for Serving of Healthy Meals during Meeting (27) were the secondary ones.

IBM SPSS Statistics 25 was used to conduct statistical analysis. The normality of the data was tested using the skewness test. Most of the variables in this study were normal so they were presented in means and standard deviations for continuous variables while frequencies and percentages for categorical variables. For the inferential statistic, Pearson product-moment correlation test and Fisher's exact test were used to determine the association between socio-demographic factors and diet quality. The independent sample t-test and one-way ANOVA were used to test the mean difference of the involvement status in gardening with diet quality and serving size. Kruskal- Wallis H Test and Mann-Whitney U tests were used to test the median difference between involvement status in gardening and serving size. The level of significance will be set at $p < 0.05$.

RESULTS

After selecting the respondents per the inclusion and exclusion criteria, the total number of respondents is 117 (40 males and 77 females) from 152 total respondents (Fig. 1). More than half of the respondents (57.3%) were above 40 years old and all of the respondents in this study were Malay (Table II). The majority of the respondents were married (67.2%), completed secondary school (65.8%), did not involve in gardening activities (72.6%), had a household size of four to six (87.2%) and had an income of less than RM4850 (83.3%) which belongs to the B40 category according to the Department of Statistics Malaysia (DOSM) (28). In addition, more than half of the respondents were employed (58.6%) and had a high physical activity level (56.4%). Those who did not work refer to the respondents that did not have a formal job and received a formal salary.

In this study, 67.5% of the respondents under-reported their energy intake while no respondent over-reported their energy intake. Overall, the MHEI composite score of the respondents was 44.51 ± 10.81 and most respondents (89.7%) had poor diet quality. When the under-reporters were excluded from calculating the diet quality, the MHEI composite score of the respondents only increased by 1.9% compared to the results that included under-reporters. There is also no significant difference between the total score ($t = -1.18$, $p > 0.05$) and composite score ($t = -1.18$, $p > 0.05$) of plausible reporters and misreporters. The result of misreporters was included because excluding those results will introduce selection bias and limit statistical power (29).

Association between socio-demographic factors and diet quality

The association between socio-demographic factors and diet quality among the respondents is shown in Table III. The Pearson product-moment correlation test finding indicates that only age ($r = 0.20$, $p=0.034$) had a

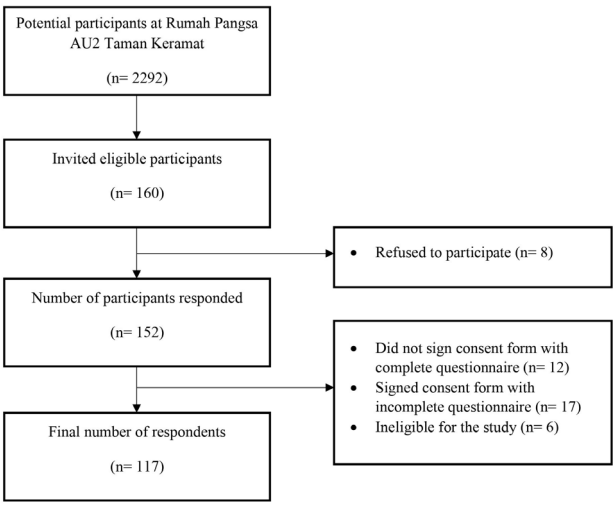

Figure 1: Flow chart of response rate in this study

Table II: Socio-demographic background, involvement status in gardening, physical activity level, dietary misreporting and diet quality of the respondents (n=117)

Variables	*n* (%)	M ± SD
Age (y)		40.98 ± 11.95
18- 20 years	2 (1.7)	
20- 29 years	26 (22.2)	
30- 39 years	22 (18.8)	
40- 49 years	31 (26.5)	
50- 59 years	36 (30.8)	
Sex		
Male	40 (34.2)	
Female	77 (65.8)	
Race		
Malay	117 (100)	
Marital status (n=114)		
Single	29 (24.8)	
Married	76 (65.0)	
Divorced/ Widow/ Widower	9 (7.7)	
Educational level		
No school	1 (0.9)	
Primary	12 (10.3)	
Lower secondary	15 (12.8)	
Upper secondary	62 (53.0)	
Pre-university	6 (5.1)	
College/ University	21 (17.9)	
Employment status (n=116)		
Employed	68 (58.6)	
Retired	1 (0.9)	
Not working	47 (40.5)	
Household size (members)		4.61 ± 1.61
1-3	28 (23.9)	
4-6	74 (87.2)	
>7	15 (12.8)	
Household income[1] (RM) (n=114)		2743.86 ± 1717.02
<4850 (B40)	95 (83.3)	
4851-10959 (M40)	19 (16.7)	
Involvement status of gardening		
Not involve	85 (72.6)	
Community gardening only	16 (13.7)	
Home gardening only	9 (7.7)	
Community and home gardening	7 (6.0)	
Physical activity level[2]		
Low (< 600 MET-minutes/ week)	29 (24.8)	
Moderate (600 - 2999 MET-minutes/ week)	22 (18.8)	
High (≥ 3000 MET-minutes/ week)	66 (56.4)	
Diet quality		
Total score		40.06 ± 9.73
Composite score (%)		44.51 ± 10.81
Poor diet	105 (89.7)	
Diet require improvement	12 (10.3)	
Good diet	0 (0.0)	

[1] Household Income & Basic Amenities Survey Report 2019 by DOSM (29)
[2] Classification of MET-minutes/ week based on Craig et al. (48)

Table III: Association between socio-demographic factors and diet quality among the respondents (n=117)

Variables	Diet quality		M ± SD	r/ X^2	p
	Poor n (%)	Required improvement n (%)			
Age				0.20	0.034 *
18-19 years	4 (3.8)	0 (0.0)	38.93 ± 10.00		
20-29 years	22 (21.0)	2 (16.7)	41.86 ± 10.78		
30-39 years	19 (18.1)	3 (25.0)	43.88 ± 12.58		
40-49 years	28 (26.7)	3 (25.0)	44.35 ± 11.09		
50-59 years	32 (30.5)	4 (33.3)	47.42 ± 9.20		
Sex					0.216 [a]
Male	38 (36.2)	2 (16.7)	41.94 ± 10.54		
Female	67 (63.8)	10 (83.3)	45.84 ± 10.77		
Race					
Malay	105 (100.0)	12 (100.0)	44.51 ± 10.81		
Marital status (n=114)					0.332 [a]
Married	66 (64.7)	10 (83.3)	47.05 ± 9.92		
Single/ Divorced/ Widow/ Widower	36 (35.3)	2 (16.7)	39.43 ± 10.76		
Educational level					0.730 [a]
Before secondary	80 (76.2)	10 (83.3)	45.41 ± 11.04		
After secondary	25 (23.8)	2 (16.7)	41.52 ± 9.57		
Employment status (n=116)					0.230 [a]
Employed	63 (60.6)	5 (41.7)	44.10 ± 10.20		
Not working/ Retired	41 (39.4)	7 (58.3)	44.92 ± 11.75		
Household size				-0.06	0.530
1-3	24 (22.9)	4 (33.3)	47.68 ± 10.79		
4-6	68 (64.8)	6 (50.0)	43.19 ± 10.98		
>7	13 (12.4)	2 (16.7)	45.10 ± 9.21		
Household income[1] (RM) (n=114)				-0.08	0.396
<4850	85 (83.3)	10 (83.3)	44.64 ± 11.14		
4851-10959	17 (16.7)	2 (16.7)	45.19 ± 8.72		

*Significance at p<0.05 for Pearson product-moment correlation test
[a] p-value for Fisher's exact test
[1] Household Income & Basic Amenities Survey Report 2019 by DOSM (29)

significantly weak positive correlation to diet quality in this study.

Difference between involvement status of gardening and diet quality

Table IV shows the difference between the respondents' involvement status in gardening and diet quality. Those involved in gardening had a slightly lower mean diet quality compared to those not involved. However, the difference between the two groups is not significant. Further analysis shows that only respondents involved

Table IV: Difference between involvement status of gardening and diet quality among the respondents (n=117)

Variables	Diet quality		M ± SD	t	p
	Poor n (%)	Required improvement n (%)			
Involvement of gardening				-1.69	0.096
Involve	28 (26.7)	4 (33.3)	43.63 ± 11.59		
Not involve	77 (73.3)	8 (66.7)	46.84 ± 8.10		
Involvement of community gardening				-2.63	0.011*
Involve	19 (18.1)	4 (33.3)	48.47 ± 7.03		
Not involve	86 (81.9)	8 (66.7)	43.54 ± 10.77		
Involvement of home gardening				0.12	0.902
Involve	15 (14.3)	1 (8.3)	44.56 ± 11.14		
Not involve	90 (85.7)	11 (91.7)	44.20 ± 8.73		

*Significance at p<0.05 for independent sample t-test

in community gardening had a significantly higher diet than those not (p=0.011).

Table V shows the difference between the involvement status of gardening with the serving size of MHEI components among the respondents. Those involved in gardening had a significantly higher intake of fruits and a lower intake of total fat. When diving deeper into the types of gardening involvement, there is a significantly higher fruit intake (p=0.036) of those who joined community gardening than those who did not. Moreover, those who were involved in gardening were able to meet three of the minimum dietary recommendations for the components of MHEI, while those who did not involve were only able to meet two.

DISCUSSION

The current study contributed to the gaps in the association between diet quality and gardening among urban poor adults. As expected, most respondents had poor diet quality because many residents in low-cost flats are from the B40 income level. Nevertheless, there is no significant difference between household income and diet quality. It is because an increase in income does not guarantee a demand for better diet quality as other socio-demographic factors like ethnicity, sex and cultural background or behavioural factors might be more important determinants for diet quality (30). In fact, Malay ethnicity was identified to have lower diet quality than Chinese and Indian as they tend to consume high energy-dense food such as fried chicken, fried rice, and curry puff and a less varied diet (31, 32).

Age was the only socio-demographic factor that showed a significant modest positive association with diet quality in this study. The older the respondents, the higher the diet quality was observed. The finding is consistent with the previous studies in which older adults were associated with higher diet quality (33, 34). Further analysis showed that older adults had lower fat and sodium intake than younger adults, which resonates with the finding of a population-based study in Brazil and the Malaysian Community Salt Survey, respectively (34, 35). It could be attributed to the diet practice for disease prevention; they are more resistant to nutrition transition than younger adults (33). Malaysia is currently experiencing pattern four of the nutrition transition, according to Popkin (36), the degenerative disease, as the people are shifting from a more traditional diet to a more westernised or global diet and lifestyle. It was also found that those respondents who were involved in community gardening were in the older age group, which is a contributing factor to better diet quality (37). However, another cross-sectional study in Kuala Lumpur found a negative relationship between age and diet quality where increasing age led to lower diet quality (31). The possible explanation for the contradictory finding is due to older populations tended to experience a decline in appetites and low nutritional conditions.

Table V: Difference between involvement status of gardening with the serving size of Malaysian Healthy Eating Index components among the respondents (n=117)

Variables	M ± SD/ Median (IQR)		t/ U	p
	Involve (n=32)	Not involve (n=85)		
Rice, other cereals, wholegrain cereal-based products and tubers [a, 1]	2.99 ± 0.91	2.89 ± 1.26	-0.48	0.635
Fruits [a, 2]	1.00 (0.00 – 2.00)	0.00 (0.00 – 1.00)	1045.00	0.036#
Vegetables [a, 2]	1.00 (0.50 – 1.59)	0.75 (0.25 – 1.27)	1069.50	0.074
Meat, poultry and egg [a, 1]	1.07 ± 1.10	1.10 ± 0.95	0.17	0.869
Fish [a, 1]	0.69 ± 0.59	0.66 ± 0.67	-0.25	0.804
Legumes (combine bean, lentil and soy) [a,2]	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.25)	1212.50	0.245
Milk and milk products [a, 2]	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	1327.50	0.716
Total fat (% from total EI) [b, 1]	28.84 ± 8.78	32.93 ± 8.66	2.27	0.025*
Sodium (mg) [b, 1]	1548.76 ± 1021.45	1573.62 ± 951.86	0.12	0.902

[a] Serving size based on recommendations of the Malaysian Dietary Guidelines (25)
[b] Serving size based on 85th percentile from Malaysian Adult Nutrition Survey data (23)
[1] Independent sample t-test
[2] Mann-Whitney U Test
* Significance at p<0.05 for independent sample T-test
# Significance at p<0.05 for Mann-Whitney U Test

Hence, the finding is still not consistent.

In line with the current study, past studies discovered a significantly higher fruit intake among gardeners, especially community gardeners (38–40). It might be because those who participated in community gardening were more accessible to fruits. Sameeha et al. (41) reported that fruits and vegetables availability and low cost are among the facilitators that encourage the intake of low-income individuals. They also perceive that the taste of produce grew in community gardens was superior to those sold in grocery stores and had the convenience of obtaining the produce just by walking to the community gardens (42). As there were limited spaces around the study location to plant fruit trees for home gardening, as reported by Ghazali (43), home gardening alone is not sufficient to influence fruit intake. Hence, the committee members should promote their community gardens and teach gardening skills to encourage more residents from the same community to contribute and enjoy the harvests together (42).

Nevertheless, the current finding is inconsistent with past studies on vegetable intake among those involved in gardening activities in different populations (38–40). Those studies found significantly higher vegetable intake among gardeners. Although the result of this study is not significant, gardeners still have a higher intake of vegetables than non-gardeners. The small number of respondents participating in gardening activities could reduce the power to produce a significant difference in vegetable intake in this study. Other factors such as sensory appeal, availability of vegetables, the physical appearance of vegetables and parental controls were among the factors that influenced vegetable consumption among Malay in a qualitative study in Subang Jaya, Selangor (44). It is suggested to enhance the cooking knowledge and skills of the community, such as how to prepare and cook, to utilise produces from the community garden. A literature review highlighted improved fruit and vegetable intake or reduced dietary fat intake as the positive outcome of better cooking self-efficacy from previous studies (45).

Moreover, the gardening involvement seems to have no differences with both animal and plant protein intake. To the best of found knowledge, most of the literature on gardening involvement measured the consumption of fruits and vegetables and only limited studies looked into other food groups, fats and sodium intake. According to the systematic review by Masset et al. (46), an increase in fish consumption required the integration of aquaculture while an increase in milk consumption required dairy development projects. Although there are aquaculture activities in the community garden at the study location, it is not for free and only has a small pond for tilapia and prawn rearing. Hence, it might not be able to sustain the needs of the whole community or even its members while the price factors might hinder its purchases too.

In contrast, the previous finding contradicts the current result on salt intake because the gardening activity was targeted at growing herbs and spices along with salt and fat reduction education (47). The parents-child intervention study used the container gardening method, a garden specifically designed for the indoor urban environment, to grow herbs and spices aimed at reducing salt and fat intake among the participants. However, the result for fat intake of the current finding was in line with the finding of Companion (47). Despite not having any interventions in this study, the lower fat intake among gardeners could be due to the decreased fast food availability at home and consumption apart from nutrition knowledge and behavioural factors (40, 48).

The strength of this study is being the first study in Malaysia that looks into the association between the involvement status of gardening and diet quality which could be the baseline data for future studies. Nevertheless, there are several limitations to this study. The current study could not be generalised to other ethnic groups and does not represent the whole Malaysian population as it only sampled a community in Kuala Lumpur with all Malay respondents. Single-day 24-hour diet recall was used to estimate dietary intake and it cannot reflect the variation of the daily intake among respondents. According to the report by the United States Department of Agriculture Center for Nutrition Policy and Promotion (49), although the Healthy Eating Index (HEI) score of a 3-day diet recall was slightly higher than the single-day diet recall due to more variety of food intake, the mean intake of the components of HEI and the HEI score was similar. Since excluding implausible energy intake from the dataset might introduce unknown biases, all respondents were included in the following analysis disregarding plausibility (50).

CONCLUSION

This study concludes that the diet quality for most of the respondents was considered low and increasing age is the only socio-demographic factor that has a significant association with diet quality. Within the study community, the respondents who were involved in community gardening activities had better diet quality compared to those who did not involve. Nevertheless, home gardening involvement does not yield the same result as community gardening. Besides, there is also no significant difference between the types of gardening involvement with the serving size of MHEI components and diet quality. But when comparing the involvement of community gardening only, those who were involved had a significantly higher fruit intake.

It is suggested that the government and non-government agencies should understand the associations of socio-

demographic backgrounds and the contribution of gardening activities towards diet quality in deploying intervention strategies to address persistent poor diet quality. Due to the COVID-19 pandemic, household income of the people has been affected and accompanied by the rising cost of living as a consequence of inflation. The existing policy on urban community gardens in Malaysia is a good stepping stone for stakeholders to work together by providing training, support and resources to those in need and interested in this initiative, especially the low-income community. Efforts to promote this initiative and have proper planning to utilise limited space for suitable vegetables and fruits to support the needs of the low-income community should be prioritised.

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