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Artikel Asli/*Original Articles*

Nutritional and Physical Activity Status among Adults Living in Low-Cost Housing Area in Selangor

(Status Pemakanan dan Aktiviti Fizikal bagi Golongan Dewasa yang Hidup dalam Kawasan Perumahan Kos Rendah di Selangor)

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ABSTRACT

This study aimed to assess the nutritional and physical activity status among adults living in low-cost housing area. This cross-sectional study involved 115 adults aged from 18 to 59 years old (46 male and 69 female). Anthropometric and body composition measurements of height, weight, body fat percentage, waist and hip circumference were taken. Biochemical measurements included blood glucose, blood cholesterol and blood pressure. Dietary intake was evaluated by interviewing subjects using Food Frequency Questionnaires (FFQ). Physical activity status was determined by interviewing subjects using International Physical Activity Questionnaire (IPAQ). Most of the subjects were found to be mainly on low socioeconomic status and working as blue collar workers. The mean body mass index (BMI) for men and women were 27.3 ± 6.3 kg/m^2 and 28.5 ± 5.3 kg/m^2, respectively. The waist-hip ratio of men and women were 0.92 ± 0.07 and 0.86 ± 0.06, respectively. Mean blood pressure observed was 128.8 ± 18.8 mmHg (systolic) and 78.2 ± 12.1 mmHg (diastolic). Mean blood glucose was reported to be 6.6 ± 3.2 mmol/L while the mean blood cholesterol was 5.2 ± 1.0 mmol/L. Overall energy intake was 2705 ± 603 kcal with the contribution of 53.4% carbohydrate, 13.5% protein and 32.5% fat to overall energy intake. The nutrients that did not achieve Malaysia's Recommended Nutrient Intake (RNI) were calcium (73.1%), thiamine (70.5%), folate (25.0%) and vitamin A (19.6%). The mean physical activity of subjects was 6739.8 ± 8135.6 MET-min/week (high physical activity). In conclusion, the adults living in low-cost housing have unsatisfactory nutritional status yet they have good physical activity level which might be contributed by their occupation.

Keywords: Nutritional status; physical activity; nutrient intake; low-cost housing area

ABSTRAK

Kajian ini bertujuan untuk menilai status pemakanan dan aktiviti fizikal bagi golongan dewasa berstatus sosio-ekonomi rendah di kawasan perumahan kos rendah. Kajian hirisan lintang ini melibatkan seramai 115 orang dewasa yang berumur 18 sehingga 59 tahun (46 lelaki dan 69 perempuan). Ukuran antropometri dan komposisi badan termasuklah ketinggian, berat badan, peratus lemak tubuh, ukur lilit pinggang dan pinggul telah diambil. Ukuran biokimia pula terdiri daripada glukosa darah, kolesterol darah dan tekanan darah. Borang soal selidik kekerapan makanan digunakan untuk mendapatkan data pengambilan makanan manakala boring soal selidik aktiviti fizikal antarabangsa (IPAQ) digunakan untuk mendapatkan maklumat aktiviti fizikal. Majoriti subjek berada dalam status sosio ekonomi yang rendah dan bekerja dalam bilang kolar biru. Min indeks jisim tubuh untuk golongan lelaki dan perempuan adalah 27.3 ± 6.3 kg/m^2 dan 28.5 ± 5.3 kg/m^2. Nisbah pinggang ke pinggul untuk lelaki dan perempuan adalah 0.92 ± 0.07 dan 0.86 ± 0.06. Purata tekanan darah adalah 128.8 ± 18.8 mmHg (sistolik) dan 78.2 ± 12.1 mmHg (diastolik). Purata glukosa darah subjek adalah sebanyak 6.6 ± 3.2 mmol/L manakala purata kolesterol darah adalah 5.2 ± 1.0 mmol/L. Pengambilan tenaga adalah 2705 ± 603 kcal dicirikan dengan 53.4% karbohidrat, 13.5% protein dan 32.5% lemak. Berdasarkan saranan pengambilan nutrien Malaysia (RNI), nutrien yang tidak mencapai saranan adalah kalsium (73.1%), tiamin (70.5%), folat (25.0%) dan vitamin A (19.6%). Bagi aktiviti fizikal, subjek mempunyai min sebanyak 6739.8 ± 8135.6 MET-min/minggu (aktiviti fizikal tinggi). Kesimpulannya, golongan dewasa berstatus sosio-ekonomi rendah tidak mempunyai status pemakanan tetapi tahap aktiviti fizikal adalah tinggi disebabkan oleh pekerjaan mereka.

Kata kunci: Status pemakanan; aktiviti fizikal; pengambilan nutrient; perumahan kos rendah

INTRODUCTION

Malaysia has experienced rapid economic development and urbanization process accelerated in the past few decades (Rostam 2006). Economic development, nutrition transition as well as sedentary lifestyles have given an impact to the health status of the community (Chan et al. 2009).

According to Tenth Malaysia Plan (2010), government intended to build 78,000 unit of houses with the aim of providing an adequate supply of affordable houses

especially for low income group. Related laws will be tightened and improved in the enforcement to ensure the quality of housing units built. Among the measures adopted by the National Housing Department (Jabatan Perumahan Negara 2014) was the Community Housing Programme which provides low-cost housing area for low-income earners. Based on Selangor Housing & Property Board (2014), one of the criteria to rent a low cost house unit is the household income does not exceed RM2500 per month.

Socio-economic is one of the factors that affect the health status of an individual (Maynard et al. 2006). Findings from the Malaysian Adult Nutrition Survey (MANS) which was carried out from October 2002 until July 2003 shown that cases of obesity was the highest for those with household income between RM1500-3500 while the cases of overweight was more noticeablefor those with household income more than RM3500 (Azmi et al. 2009). A recent study conducted in Germany showed that participants with lower socioeconomic status (education and for women also income) gained more weight and waist circumference than those with higher socioeconomic status (Herzog et al. 2015).

Food habits of a community affected by the environment and the stages of economic development and food cost (Thornton et al. 2010). Based on previous study conducted in India, Aloia et al. (2013) shown that high income group were more likely to choose Western style fast food while low income group were more likely to enjoy the food vendors as fast foods. In Taiwan, Wu et al. (2011) proved that long term dietary pattern of excessive or deficient in certain nutrients will have effects on the health status.

Evidence from the National Health Morbidity Survey (IPH 2011) reported that only 64.3% (11.4 million) of adults aged 18 years old and above were physically active based on International Physical Activities Questionnaires (IPAQ) definition. Besides, World Health Organization (WHO 2014) had identified physical inactivity as the fourth leading risk factor for death worldwide.

Need assessment is a method of discovering, evaluating and prioritizing the health needs of a population (Healey & Zimmerman 2009) and this method is important for health promotion program planning. In the context of health, the aspects that needed to be considered are nutritional status (Perozzo et al. 2008) and physical activity (Liese et al. 2013).

Malaysian must have the health awareness in maintaining the well-being from all aspects in life. Assessment of nutritional status and physical activity has to be done prior to the planning of an appropriate intervention (McMahon & Brown 2000). Previous study conducted in one of the low socioeconomic population in Malaysia found that 64.5% of the population are obese and their eating habits need to be modified (Kamaruddin et al. 2013). Another study conducted in low cost housing residents (located in Kuala Lumpur) reported that status of overweight and obesity among these populations is quite high and percentage of body fat also is also beyond the normal range (Yahya et al. 2013). Nevertheless, there are not many studies focusing on this population. Hence, the present study aimed to assess the nutritional and physical activity status among adults in the low-cost housing area in Selangor.

SUBJECTS AND METHODS

STUDY DESIGN AND SAMPLING

This cross-sectional study was carried out from November 2014 until January 2015 on a sample of adults aged 18-59 years old in a low-cost housing area, phase 6, Bandar Tasik Kesuma, Beranang, Selangor. The subject was recruited by convenience sampling, but excluded those adults who were disable, pregnant and breastfeeding. The formula of Cochran (1963) was used together with the prevalence of overweight and obesity (60.5%) from National Health and Morbidity Survey 2011 (IPH 2011) and the level of acceptable error at 5%. After consider the assumption of 10% drop-out rate, the final sample size for this study was 115 subjects. The subjects were explained about the study and provided with an informed consent for their agreement. Agreed subject were recruited in this study. Study procedures were approved by the Research Ethic Committee from The National University of Malaysia (UKM1.5.3.5/244/NN-144-2014).

STUDY MEASURES

Subjects were given a questionnaire consisted of 5 parts:

DEMOGRAPHIC DATA

This section was self-administered. The questionnaires comprise questions on age, gender, ethnicity, religion, contact information, educational level, marital status, occupation, monthly income and health problems.

ANTHROPOMETRIC DATA

Subject's body height was measured using SECA Portable Stadiometer 213 (SECA, Germany) to a precision of 0.1cm. Body weight and percentage of body fat was measured by Tanita Body Composition Analyzer TBF-300 (Tanita Corporation, Japan). The calculation for basal metabolic rate was referred to Ismail et al (1998). The normal body fat percentage for man is 10-19.9% while 20-29.9% is for women (Wardlaw & Kessel 2002). Waist and hip circumference were measured with Lufkin tape, W606PM (Mexico). Waist circumference was measured at the highest point of iliac crest at minimal respiration to the nearest 0.1cm at the end of normal expiration. Hip circumference was measured from the side at the maximal extension of buttocks. All the measurement followed the standard of the International Society for the Advancement of Kinanthropometry procedures, ISAK

(2001). Body mass index (BMI) was then calculated as weight in kilograms divided by height squared in meters (kg/m^2) and categorized as underweight (< 18.5 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2) or obese (≥ 30.0kg/m^2) according to World Health Organization Expert Consultation (2004). Waist-to-hip ratio (WHR) was calculated by dividing waist circumference by hip circumference where the cut-off-point for man is < 0.90 and for women is < 0.85 according to World Health Organization (2008).

BIOCHEMICAL MEASUREMENTS

Blood pressure, blood glucose and blood cholesterol were measured, respectively after the anthropometric data was taken. Blood Pressure (BP) of subject was measured using Omron Automatic Blood Pressure Monitor HEM-7111 (Omron, Japan) with the subjects rested and seated. Blood pressure was measured with the subject in the sitting position and the arm placed at the same level as the heart. Classification of blood pressure was adapted from National Heart, Lung and Blood Institute (2003). Hypertension was defined as either elevated systolic BP or diastolic BP alone or the combination of both. Accu check® Active (Roche, Germany) was used to measure random blood glucose and the classification of normal (< 5.6 mmol/L) was based on Clinical Practice Guidelines from Ministry of Health (KKM 2009). Accu-trend® GCT (Roche, Germany) was used to measure random blood cholesterol and the normal cholesterol range in subject was < 5.2 mmol/L (National Heart Lung and Blood Institute 2005).

DIETARY ASSESSMENT

Dietary intake was assessed through interview using the Food Frequency Questionnaires (FFQ) based on the intake during the past 1 to 2 months. The questionnaire was validated and adapted from studies among the Malay (Abdul Rani 2002) and Chinese Malaysian adults (Chong & Norimah 2002). This FFQ consisted of 130 food items and beverage, which were categorized into 12 food groups. Each food item listed was given a standard serving size based on the food item weight in household measures of Atlas of Food Exchanges and Portion Sizes (Suzana et al. 2009). The conversion of food frequency to the amount of food intake was carried out using the following formula: Amount of food (g) per day = frequency of intake (conversion factor) x serving size x total number of servings x weight of food in one serving (Wessex Institute of Public Health 1995). The conversion factor used to estimate food intake was based on frequency of intake, as shown in Table 1.

To estimate under-reporting of energy intake from the FFQ, the ratio of reported total daily energy intake (EI) to basal metabolic rate (BMR) was calculated. The calculation for basal metabolic rate was referred to Ismail et al (1998). A ratio of EI/BMR below 1.2 was used as a cut-off point to identify under-reporting of energy, as suggested by Black (2000).

TABLE 1. Conversion factor used to estimate food intake

Frequency of intake	Frequency	Conversion factor
Per day	1X	1
	2X	2
	3X	3
Per week	1X	0.14 (1/7)
	2X	0.29 (2/7)
	3X	0.43 (3/7)
Per month	1X	0.03 (1/30)
	2X	0.07 (2/30)
	3X	0.10 (3/30)

PHYSICAL ACTIVITY ASSESSMENT

Physical activity was assessed using the long form of International Physical Activity Questionnaire (IPAQ) through interview session. The questionnaire was validated and tested for its reliability in 12 countries (Booth et al. 2003). This instrument composed of 5 sections which consist on the physical activity during the last seven days. Information for the length of time (the number of sessions and average time per session) spent on walking, moderate or vigorous-intensity physical activities, on both weekdays and weekends, was obtained using this questionnaire. The physical activity score was expressed using the following formula: MET-minutes/week = MET level × minutes of activity/day × day per week. The physical activity level (PAL) of subject was categorized into low (< 600 MET-minutes/week), moderate (600-3000 MET-minutes/week) and high (≥ 3000 MET-minutes/week) according to the guidelines of IPAQ (2012).

STATISTICAL ANALYSIS

Statistical analysis was analysed using the Statistical Package for Social Sciences version 21.0 (SPSS Inc., Chicago, USA). The Nutritionist Pro™ version 4.0 (Axxya Systems, Stafford, Texas) was used to analyse the nutrient intake from the FFQ. The nutrient intakes were compared to the Recommended Nutrient Intake (NCCFN 2011). Descriptive analyses were performed for demographic data and expressed as frequencies and percentages. Anthropometric, biochemical, dietary and physical activity data were expressed as percentage, mean and standard deviation. The missing data and outliers were screened before analysis. Kolmogrov-Smirnov test was used to test the normality of the data for sample more than 100 while Shapiro-Wilk test was used for sample less than 100 after excluded the under- and over-reporting data for nutrient analysis. Spearman's rho correlation was used to assess the relationship between nutritional parameter and physical activity status. The statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

SOCIO-DEMOGRAPHIC PROFILE

Table 2 shows the socio-demographic characteristics of subjects in this study. Total number of subjects was 115 and there were more female (60.0%) than male (40.0%) who participated in this study. Majority of the subjects (63.0%) aged in the range of 40-49 years old, followed by 50-59 years old (24.3%), 30-39 years old (14.8%) and finally 20-29 years old (6.1%). By ethnicity, there were 91.3% Malays, 5.2% Indians while the remaining 3.5% were Iban and Malay-Indian. By religion, a total of 94.8% were Islam, 4.3% were Hindu and 0.9% was Christian. More than half of the subjects (55.7%) completed upper secondary education, 21.7% finished lower secondary education, 10.4% finished primary education, 7.8% achieved tertiary education and 4.3% had never attend school. 87% of the subjects were married, 9.6% widowed and the remaining 3.5% were either single, divorced or separated. Most of them (38.3%) were unemployed, including housewife, students and retired person. There were 19.1% having own small business or roadside stall, 17.4% were private worker, 13.0% were government worker and others with 12.2%. Based on Selangor Housing & Property Board (2014), one of the criteria to rent a low cost house unit is the household income does not exceed RM2500 per month. Therefore, 80.0% of the subjects had the monthly household income less than RM2000 and 20% had monthly household income between RM2000 to RM3999.

TABLE 2. Socio-demographic characteristics of subjects (n = 115)

Characteristics	n	%
Gender		
Male	46	40.0
Female	69	60.0
Age (year)		
20-29	7	6.1
30-39	17	14.8
40-49	63	54.8
50-59	28	24.3
Ethnic		
Malay	105	91.3
Indian	6	5.2
Others	4	3.5
Religion		
Islam	109	94.8
Hindu	5	4.3
Christian	1	0.9
Educational level		
No formal education	5	4.3
Primary education	12	10.4
Lower Secondary education	25	21.7
Upper Secondary education	64	55.7
Tertiary education	9	7.8
Marital status		
Married	100	87.0
Widowed	11	9.6
Single, divorced or separated	4	3.5
Occupation		
Government worker	15	13.0
Private worker	20	17.4
Business	22	19.1
No work	44	38.3
Others	14	12.2
Monthly income		
< RM2000	92	80.0
RM2000-RM3999	23	20.0
> RM4000	-	-
Health problem		
No	79	68.7
Yes	36	31.3
Smoking		
No	87	75.7
Yes	28	24.3

NUTRITIONAL ASSESSMENTS

Anthropometric parameter shown that majority of the subjects have the mean BMI in overweight category (28.0 ± 5.7 kg/m^2), have high body fat percentage (36.7 ± 12.1%) and waist to hip ratio above the normal range (0.88 ± 0.07). These results were in agreement with local studies carried out among adults in Kelantan (Lee 2014) and Perak (Lim et al. 2012). Study by Lee (2014) reported the mean BMI of overweight with 28.0 ± 6.2 kg/m^2 and high body fat percentage with 36.2 ± 6.4% were found in low income female housing residents, whereas previous study by Lim et al. (2012) focused on among 362 subjects with different ethnicity showed mean BMI in overweight subjects were 27.5 ± 5.0 kg/m² and high body fat percentage was reported with 34.2 ± 6.8%, respectively This value is in agreement with our observed results. An epidemiological survey to determine cardiovascular disease risk in a semirural community in Kuala Langat also found the mean waist hip ratio in the range of above normal range (0.92 + 0.10) (Chin & Pengal 2009). The waist hip ratio that exceed the normal cut-off point always link with mortality risk resulted from cardiovascular and heart diseases World Health Organization (2008). Oxidative stress in overweight or obese people might increase the risk for getting diabetes, hypertension, cardiovascular disease and heart disease (Vincent & Taylor 2006). Overweight and obesity may lead to other complications such as hypertension, dyslipidaemia, type II diabetes and cardiovascular disease, thus affect the quality of life of individuals (Popkin et al. 2012). Hence, the nutritional status of subjects in this study was linked to high risk of non-communicable diseases.

For biochemical measurement, mean systolic blood pressure we categorized as prehypertension category (128.8 ± 18.8 mmHg) while mean diastolic blood pressure was normal (78.2 ± 12.1 mmHg). This is in agreement with Zulkafli (2012) and these were probably due to high dietary sodium intake (Zulkafli 2012) which exceeded the recommended amount from Malaysian Dietary Guidelines, MDG (NCCFN 2011). Subjects' blood glucose and blood cholesterol were also exceeded the normal level, which were 6.6 ± 3.2 mmol/L and 5.2 ± 1.0 mmol/L, respectively. Our findings were in line with the study conducted by Chin & Pengal (2009) in semi-rural area, where the mean blood glucose and cholesterol were 6.8 + 3.6 mmol/L and 5.8 + 1.2 mmol/L, respectively. A study carried out among women in a low-cost housing area in Cheras also shown that their biochemical measurement did not fall in between normal range where 66.0% of them reported that they had been diagnosed with chronic diseases which include diabetes mellitus, hypertension and heart disease (Yahya 2013).

Table 3 and 4 shows the energy and nutrients intake by subjects (gender specific) according to Malaysian Recommended Nutrient Intake (NCCFN 2011). However, we will only discuss the overall analysis. After excluding the under and over-reporting dietary intake, only 95 subjects were included in the dietary analysis. Dietary assessment revealed that the subjects had a mean energy intake of 2705 ± 603kcal. The mean energy percentage contributed from carbohydrate, protein and fat were 53.4%, 13.5% and 32.5%, respectively. According to the recommendation from NCCFN (2011), the macronutrients distribution was 55-70% carbohydrate, 10-15% protein and 20-30% fat. In this study, subjects mean fat intake had exceeded the recommended macronutrients requirements and this might be due to their high consumption of high fat, oily food and coconut milk-based dishes. On the other hand, subjects' carbohydrate intake was less than the recommendation. Besides, the nutrients that achieved the Malaysia's RNI were zinc, selenium, riboflavin, niacin, vitamin C and vitamin E There were also some of the nutrients that did not achieve the recommendation, which include calcium, thiamine, folate and vitamin A. This could be due to their dietary habitual intake that are lacking of milk, fruits and vegetables.

TABLE 3. Energy and nutrients intake by male subjects according to Malaysian Recommended Nutrient Intake following age group (n = 37)

Nutrient	19-29 (n = 2)			30-50 (n = 21)			51-59 (n = 14)		
	Mean ± SD	RNI	%RNI	Mean ± SD	RNI	%RNI	Mean ± SD	RNI	%RNI
Energy (kcal)	3423 ± 495	2400	140.3	2845 ± 531	2460	115.7	2691 ± 675	2460	109.4
Macronutrient									
Protein (g)	84.2 ± 19.7	62	135.9	102.0 ± 32.4	62	164.5	95.6 ± 26.7	62	153.2
Micronutrient									
Calsium (mg)	435.4 ± 115.2	800	54.4	752.0 ± 312.2	800	94.0	711.4 ± 350.3	800	88.9
Zinc (mg)	4.4 ± 2.5	6.7	65.	7.5 ± 3.0	6.7	112.1	7.4 ± 4.2	6.7	110.3
Selenium (µg)	48.5 ± 10.9	33	145.5	40.6 ± 25.1	33	124.2	34.4 ± 17.2	33	104.2
Thiamine (mg)	0.9 ± 0.4	1.2	70.8	0.9 ± 0.4	1.2	76.7	1.0 ± 0.4	1.2	80.8
Riboflavin (mg)	1.4 ± 0.5	1.3	107.7	2.1 ± 1.8	1.3	158.5	1.3 ± 0.3	1.3	100.0
Niasin (mg NE)	18.0 ± 11.9	16	112.5	20.4 ± 11.3	16	127.5	15.5 ± 5.7	16	96.8
Folate (µg)	95.2 ± 37.4	400	23.8	120.5 ± 67.1	400	30.3	101.8 ± 35.9	400	25.5
Vitamin C (mg)	44.3 ± 1.3	70	62.9	71.2 ± 43.5	70	101.4	77.3 ± 42.2	70	110.4
Vitamin A (µg)	106.9 ± 36.8	600	17.8	107.1 ± 67.9	600	17.8	73.9 ± 51.8	600	12.3
Vitamin E (mg)	8.1 ± 3.5	10	81.0	12.7 ± 6.0	10	127.0	12.0 ± 6.4	10	120.0

TABLE 4. Energy and nutrients intake by female subjects according to Malaysian Recommended Nutrient Intake following age group (n = 37)

Nutrient	19-29 (n = 4)			30-50 (n = 47)			51-59 (n = 7)		
	Mean ± SD	RNI	%RNI	Mean ± SD	RNI	%RNI	Mean ± SD	RNI	%RNI
Energy (kcal)	2286 ± 448	2000	114.3	2710 ± 608	2180	124.3	2318 ± 521	2180	106.3
Macronutrient									
Protein (g)	78.4 ± 25.9	55	142.5	89.4 ± 25.6	55	162.5	70.7 ± 24.0	55	128.6
Micronutrient									
Calsium (mg)	452.8 ± 208.4	800	56.6	633.6 ± 304.4	800	79.2	655.2 ± 402.6	1000	65.5
Zinc (mg)	4.3 ± 1.1	4.9	86.7	6.8 ± 3.7	4.9	138.6	6.1 ± 4.9	4.9	125.1
Selenium (µg)	35.2 ± 13.5	25	140.8	36.8 ± 20.1	25	147.4	19.5 ± 14.0	25	77.8
Thiamine (mg)	0.7 ± 0.3	1.1	60.0	0.8 ± 0.3	1.1	73.6	0. 7 ± 0.2	1.1	60.9
Riboflavin (mg)	1.1 ± 0.3	1.1	95.5	1.5 ± 1.1	1.1	140.0	1.9 ± 2.6	1.1	176.4
Niasin (mg NE)	11.2 ± 2.3	14	79.9	14.3 ± 5.8	14	101.8	14. 5 ± 12.4	14	103.2
Folate (µg)	72.7 ± 22.6	400	18.2	99.1 ± 56.8	400	24.8	111.1 ± 92.0	400	27.8
Vitamin C (mg)	77.9 ± 54.5	70	111.3	73.5 ± 63.8	70	104.9	69.1 ± 47.3	70	98.8
Vitamin A (µg)	200.1 ± 82.5	500	40.0	92.3 ± 74.7	500	18.5	54.2 ± 104.2	500	10.8
Vitamin E (mg)	7.2 ± 1.6	7.5	96.1	16.1 ± 15.2	7.5	215.2	13.2 ± 10.3	7.5	176.1

Based on the overall results, only 73.1% achieved the recommended calcium intake based on the RNI and this is in line with previous study conducted in low-cost housing area residents (Chong 2014; Ng 2013). Low income populations tend to have low calcium intake from their diet and it can be as low as only 52% of RNI. The reasons for this could be partly due to the subjects seldom drink milk and rarely include daily products in their diet, and only claimed to include sweetened condensed milk in the preparation of beverage such as coffee, the tarik and malt-chocolate drinks.

Subject's dietary intake from diet showed only 70.5% achieved the requirement for thiamine. Findings from other studies amongst adults in low-cost housing area in Kuala Lumpur also shown that they did not achieve the recommended intake based on RNI for thiamine and the lowest intake was 67% (Ng 2013; Yahya 2013). However, this problem can be intervened by having fortified cereals, enriched white bread, beans, lentils, red meat, seafood and skimmed milk, (Chocano-Bedoya et al. 2011; Darling et al. 2013).

Folate can be easily meeting the recommended intake if the daily meals consist of green leafy vegetables, fruits as well as mushrooms (Chen et al. 2005). However, 25.0% of the subjects did not meet the recommended intake probably due to lack of fruits and vegetables in their diet. This result was in line with the study of (Lee 2014) that reported the percentage of folate among Malay women is as low as 25.7%.

Among all the nutrients, vitamin A intake is the least achieved based on the recommended intake by the RNI where only 19% of the subjects met the recommendation. This finding was inconsistent with the previous studies where the finding of Chong (2014) achieved up to 169% while the finding of Yahya (2013) achieved vitamin A three times more than the recommended intake. This discrepancy could be due to the lack of vitamin A rich foods in their diet. Vitamin A can be found abundant in the foods such as liver, egg, dairy products (whole fat), fish oil and green leafy vegetables (spinach) and yellow-orange vegetables (carrot) (Tang et al. 2005; West & Mehra 2010). Recent evidences stated that there were significant interaction between socioeconomic position and dietary costs indicated that the association between dietary costs and fruits and vegetable intake was stronger for less-educated and lower-income groups (Mackenbach et al 2015). Foods of lower nutritional value and lower-quality diets generally cost less per calorie and tended to be selected by groups of lower socioeconomic status. A number of nutrient-dense foods were available at low cost but were not always palatable or culturally acceptable to the low-income consumer. Acceptable healthier diets were uniformly associated with higher costs (Darmon & Drewsnowski 2015).

PHYSICAL ACTIVITY ASSESSMENT

Table 5 shows the physical activity status of subjects based on IPAQ. More than half of the subjects (57.9%) had a high physical activity level, followed by 35.1% had moderate and the remaining 7.9% had low physical activity. The mean of metabolic equivalent score (MET) score for high, moderate and low physical activity level were 10708.4 ± 8899.2 MET-minute/week, 1726.9 ± 622.2 MET-minute/week and 357.4 ± 143.9 MET-minute/week, respectively. By physical activity domain distribution, majority of the subjects spent 53.6% for occupation, 22.8% for housework, 12.8% for leisure time and 10.8% for transport.

Those with the low physical activity are partly due to their sedentary lifestyle. Although there is a large percentage of women were housewife, they practised active lifestyle by doing the daily housework, climb up and down the stairs of flat, walk to the stall in the residential area or walk to the nearest market for grocery.

TABLE 5. Physical activity status based on IPAQ

	%	Mean + standard deviation (MET-minute/week)
Level of physical activity		
Low	7.9	357.4 ± 143.9
Moderate	35.1	1726.9 ± 622.2
High	57.9	10708.4 ± 8899.2
Overall		6739.8 ± 8135.6
Domain of physical activity		
Occupation	53.6	-
Transport	10.8	-
Housework	22.8	-
Leisure time	12.8	-

The high physical activity among subjects in this study was contributed by their occupation. The subjects in this low-cost housing area were mainly the blue collar workers who work as a labour in the area of construction, mechanical, factory or small business stall. Therefore, their occupation normally involved rough work which require high and strong energy usage and indirectly increased their daily physical activity. A study from the United States also supported this finding by which the found that high physical activity of blue collar workers were contributed by their occupation (Caban-Martinez et al. 2007). This low income population rarely have the chance for leisure time doing physical activity as they had long work duration, packed with work shift or even worked for few different jobs. From the economic facet, they have to spend most of their time in earning money for daily life sustenance.

Previous study conducted in Taiwan showed that there was an association between physical activity based on occupation and the cardiovascular risks and mortality among ethnic male adults (Hu et al. 2013). This reflects that high occupational related physical activity may bring adverse effect to health. The interview session on physical activity with subjects had found out that they rarely spend time for exercise or involve in sport activity.

ASSOCIATION BETWEEN NUTRITIONAL PARAMETER AND PHYSICAL ACTIVITY

Table 6 shows the association between nutritional parameter with physical activity (total score IPAQ). There was no association between anthropometric, biochemical and dietary intake parameter with total score of physical activity. Thus, physical activity status might not be a suitable indicator to determine the health status among adults in low cost housing area.

TABLE 6. Correlation between nutritional parameter and physical activity (total score IPAQ)

Nutritional parameter	Total Score IPAQ	
	r value	p value
Anthropometric parameter		
Body mass index (kg/m²)	0.073	0.439
Body fat percentage (%)	-0.109	0.246
Waist hip ratio	0.161	0.088
Biochemical paramter		
Systolic pressure (mmHg)	0.087	0.360
Diastolic pressure (mmHg)	0.005	0.959
Blood Glucose (mmol/L)	0.086	0.366
Blood Cholesterol (mmol/L)	-0.025	0.796
Dietary parameter		
Energy intake (kcal)	0.029	0.756
Carbohydrate (g)	0.069	0.468
Protein (g)	0.129	0.171
Fat (g)	-0.034	0.719

* Significant at $p < 0.05$ based on Spearman's rho correlation

This study has several limitations that could impact the study findings. Firstly, subjects in this study only represent residents from one low-cost housing area and generalization can be made to all low-income earners in Malaysia. Secondly, there is a probability for recall bias and under- or over-estimate food intake when using FFQ. Finally, there might be under- or over-reporting while estimating the duration and frequency of the physical activity as the bias can be occurred. Despite these limitations, this study was able to reveal the nutritional and physical activity status among adults in low-cost housing area in Selangor. This study also was focused on the rural part of Selangor where this could be a preliminary research to curb the problem of malnutrition among these population. The results could also be utilized as a baseline data for intervention programme or as a reference for policy making in future studies involving nutrition priority research area.

CONCLUSION

The adults living in low-cost housing area have unsatisfactory nutritional status but with good physical activity status. This might be contributed by their nature of occupation. The results of this study highlighted the need for balanced diet and promotion of healthy lifestyle among this population which in turn provide insights for how and where nutritional education, intervention programmes or policies may best be targeted.

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