ORIGINAL ARTICLE

ASSESSMENT OF DIET QUALITY AMONG MARRIED COUPLES IN A SELECTED URBAN AREA IN SELANGOR

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ABSTRACT

Introduction: The aim of this study was to assess the overall diet quality of husbands and wives in a selected urban area in Selangor.

Methodology: This cross-sectional study was carried out in Bandar Baru Bangi, Selangor among 150 married couples aged 20 and above, who voluntarily agreed to participate and were not practicing any special diet. Data were collected using a 2-day 24-Hour Dietary Recall and a Food Frequency Questionnaire (FFQ) to evaluate the quality of diet among husbands and wives using the Diet Quality Index Revised (DQI-R).

Result: Majority of husbands and wives in this study were in the middle-age group, had received tertiary education, had household monthly income of more than RM3, 500 and encompass household size of 3 to 5 persons. The mean DQI-R score for husbands (mean age= 43.33 $\pm$ 11.16 years) and wives (mean age= 41.28 $\pm$ 10.93 years) were 67.8 $\pm$ 9.1 and 64.4 $\pm$ 9.3 respectively and there was a significant different in scores between the husbands and wives ($p < 0.001$). In general, the diet quality of this study population was not satisfactory and that the diet quality of husbands was better compared to their wives.

Conclusion: This study gives an insight picture of husbands and wives' quality of diet. It can be used as a guideline to improve health intervention programs in the future.

Keywords: Diet quality, diet quality index revised, urban area, husbands, wives, Selangor.

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INTRODUCTION

Diet quality is described as the capability of conducting one complete assessment of dietary intake which combines the Food Guide Pyramid, Recommended Dietary Allowances, and Dietary Guidelines and not just relying upon one single nutrient or food group only [1]. In addition, diet quality is defined as really the end result of the food eaten, preparation techniques used, and other factors influencing the nutrient content of meals [2]. Diet quality of husbands and wives living in the same household were assumed to be similar [3]. However, this was disagreed by some researchers [4] [5]. In a study done in US found that wives reported significantly more servings of fruits per week, greater variety in both fruit and vegetable choices, and higher energy-adjusted nutrient intakes than did their husband [4]. Another study had also found that the linear regression model was significantly different from zero for all husband-wife pairs for all energy-adjusted nutrient intakes, except for iron and protein which indicates that, overall, the wife's energy-adjusted nutrient intake was not similar of the husband's energy-adjusted nutrient intake [5]. These findings do not support the presumption that husbands and wives eat a similar diet. The understanding which suggest that an intervention on dietary aimed at women can have an effect on their husbands and may be a cost effective approach to healthy dietary change for both women and men is debateble [5]. The differences in husbands and wives diet is may be due to intake is unlikely similar in many families during purchasing their noon meal at work or school cafeterias as well as making individual choices when dining out [5]. Although there is a difference in husbands and wives diet, studies have showed that wives play an important role towards husbands' dietary quality [4, 6, 7].

Two indirect approaches have been suggested which were based on the composition of predefined diet quality indices using current nutrition knowledge (theoretically defined dietary patterns) and the other approach is based on statistical techniques (empirical dietary patterns) to capture the overall diet quality [8]. This view is supported by Kant (2004) [9] who pointed out two distinct approaches for examining overall diet which were based on current hypotheses and guidance about the role of nutrients in disease prevention while the second approach is data driven, with dietary exposure summarized using statistical techniques of factor and cluster analyses. The most discussed indices were the Healthy Eating Index (HEI) [10] and the Diet Quality Index (DQI) [11] which were later updated into Healthy Eating Index 2005 (HEI-2005) [12] and into Diet Quality Index Revised (DQI-R) respectively [13]. Basically, both indices were constructed based on nutrition guidelines and recommendations, and were able to reflect the diet quality [8]. Apart from that, both indices were developed using both nutrients and food groups compared to other indices that were either based on only nutrients or only food/food groups. In DQI-R, dietary diversity and moderation were included as part of the DQI-R components which were able to depict the variety and moderation in one's diet. Low scores reflect poorer achievement of dietary recommendations and higher scores reflect better diet quality [8].

Far too little attention has been paid to assessment of overall diet quality of Malaysian's population. The aim of this study is to determine the diet quality of husbands and wives in the selected urban area of Selangor. This information would be useful in tailoring intervention and education materials to better reach the targeted population. Besides, it may also provide more insights into the use of spouse-surrogate dietary information in epidemiologic studies. This study seeks to address the following questions:

1. How is the diet quality of husbands and wives in Bandar Baru Bangi?
2. Does husbands and wives' diet quality reflect each others?

MATERIAL AND METHODS

Sampling design and sample size

The study design was a cross-sectional study which was conducted in the area of Bandar Baru Bangi, one of the suburbs in Klang Valley. Bandar Baru Bangi was selected to represent the urban area based on stratified random sampling. Sample size was determined based on G*Power 3, a statistical power analysis program for the social, behavioral, and biomedical sciences [14]. As a result from G*Power 3 analysis, minimum sample size for two groups (husbands and wives) was 105 person at least in each group. For this study, 150 married couples, aged 20 years and above were recruited. In order to ensure that every household has an equal chance of being selected, systematic selection was utilized. That is, in each street within the selected housing area, houses with odd numbers were selected. Husbands and wives aged 20 and

above, who voluntarily agreed to participate and were not practicing any special diet, were eligible to participate in this study. The ethical approval for the study was granted by the Medical Research Ethical Committee of the Faculty of Medicine and Health Sciences (FMHS), University Putra Malaysia.

Data Collection

Data were collected from August 2008 until December 2008. The data collection had been done in selected sections (Section 1, Section 2, Section 3, Section 7, Section 8, Section 15 and Section 16) which were randomly selected from the 16 sections to represent Bandar Baru Bangi. Every odd numbered house was approached in each section with the help of trained enumerators. Attempt made for each odd numbered house were made concerning the fact that response rate will be lower since some of the residents were not at home during weekends and most of them were working during weekdays and some of them worked on weekends too. Those who voluntarily agreed to participate were given each a set of questionnaire and were interviewed face to face either by researcher or trained enumerators. The completed questionnaire was immediately collected.

Research Instruments

The questionnaire included demographic and socioeconomic of the respondents. In this study, Diet Quality Index Revised (DQI-R) was measured based on 2-day 24 hour dietary recall and Food Frequency Questionnaire (FFQ) of respondents. Respondents completed a 2-day 24 hour dietary recall including 1 weekday and 1 weekend day. Dietary intakes were analyzed for total daily caloric intake; total daily intake from carbohydrate (g), fat (g), and protein (g); percent energy from carbohydrate, fat, and protein; dietary fiber (g). After completion of the dietary records, analysis of nutrient composition was conducted using the Nutritionist Pro software program (Axxya, USA) which contains nutrient composition data of Malaysian foods. In this study, the FFQ used was adapted from The Malaysian Adult Nutrition Survey (MANS) 2003. The MANS study had used a semi-quantitative FFQ, with serving sizes as a reference. The frequency of intake of each food item was listed either per day, per week, per month, per year or never [15]. However, for the purpose of this study, the FFQ included only the frequency of food consumed.

Diet Quality Index Revised (DQI-R) [13] is one of the tools used to measure overall diet quality. This index consisted of 10 components that measure the intake of three food groups (grain products, vegetables and fruits), five nutrients (total fat, saturated fat, cholesterol, calcium and iron), diet diversity (based on the sum of grain products, vegetables and fruits, milk products, meats and alternatives) and diet moderation (amount of added fat, added sugar, sodium and alcohol) (Table 1).

Table 1 Components of Diet Quality Index Revised (DQI-R), the number of points available for each, and the scoring criteria required to receive the highest and lowest scores

Component	Score	Scoring criteria
1. Total fat ≤30% energy	0-10 points	≤30% = 10 >30, ≤40 = 5 >40 = 0
2. Saturated fat ≤10% energy intake	0-10 points	<10% = 10 >10, ≤13 = 5 >13% = 0
3. Dietary cholesterol <300mg/day	0-10 points	<300mg = 10 >300, <400mg = 5 >400mg = 0
4. 3-5 servings fruit per day[a], % recommended servings	0-10 points	≥100% 99%-50% <50%
5. 3-5 servings vegetables per day[a], % recommended servings	0-10 points	≥100% 99%-50% <50%
6. 8-12 servings grains per day[a], % recommended servings	0-10 points	≥100% 99%-50% <50%
7. Calcium intake as % RNI for age, % recommended servings	0-10 points	≥100% 99%-50% <50%
8. Iron intake as % RNI for age[c], % recommended servings	0-10 points	≥100% 99%-50% <50%
9. Dietary diversity score	0-10 points	≥6 ≥3, <6 <3
10. Dietary moderation score	0-10 points	≥7 ≥4, <7 <4

[a]RNI = Recommended nutrient intake

[b]Iron bioavailability of 15% was used.

It is recommended to use bioavailability of 15% for those in middle and higher income categories [1]

[c]For the recommended servings, minimum size of servings recommended were used.

The range of possible scores for each component was 0 to 10 points, depending on the level of intake, and the maximum possible DQI-R score was 100 points. Low scores reflect poor compliance with dietary guidelines [8]. The first three components of DQI-R which were the total fat, saturated fat, and cholesterol were calculated as percentage of total energy and categorically scored as 0, 5, or 10. It is then followed by the goals for the fruit, vegetable, and grain components which were adjusted based on the Malaysian Dietary Guidelines [16] and were scored as continuous variable from 0 to 10, proportional to the recommended range of intake. The DQI-R components for calcium and iron were adjusted to the Malaysian Recommended Nutrients Intake (RNI) [17] which were age-dependent and were also scored as continuous variable from 0 to 10. The last two components of DQI-R were diversity and moderation scores. The diversity score was modified from the original version to reflect consumption of 19 different broad food group categories instead of 23 food groups and were categorized under four food subgroups. Each food subgroup was given a maximum diversity score of 2.5 of the possible 10 points if the respondent was considered as a consumer. The serving size followed the Malaysian Dietary Guidelines [16] quantity criteria. In this study, to be considered as a "consumer", respondents were needed to report at least one serving [13]. Therefore, inclusion of at least one serving of food per day from each of the four food groups (meat/poultry/fish/egg, dairy/beans, grains, fruits, and vegetables) defines the maximum overall variety score. If intake of any of these

food groups is missing, the score is reduced. Dietary moderation scores consist of four elements; sugar, discretionary fat, sodium intake, and alcohol consumption. Each component provides 2.5 points with the maximum total score of 10.0 points. The scoring criteria include 2.5, 1.5, 1.0 and 0 points. Discretionary fat is defined as all additional fat in food beyond the amount found in the lowest fat forms, as well as fat added to food in preparation or at the table [18]. These four elements were to reflect "discretionary" behavior on the part of the respondents; more specifically, participants can regulate the quantity of sugar, alcohol, and salt [19].

Data Analysis

Descriptive analysis by SPSS was used to describe the characteristics of the respondents and their diet quality. Nutritionist Pro software (Axxya, USA) was used to analyze the dietary intake obtained from the 24-hour dietary recall.

RESULTS

This cross-sectional study was carried out in Bandar Baru Bangi among 150 Malay married couples aged 20 and above, who voluntarily agreed to participate and were not practicing any special diet. The mean age was 43.33 $\pm$ 11.16 years for husbands and 41.28 $\pm$ 10.93 years for wives. With regards to socio-demographic status, it was observed that the majority of the husbands had received tertiary education (71.9%) and was predominantly professional group based on occupation (30.0%), as shown in Table 2. As for wives, majority of them had also received tertiary education (60.0%) but most of them were housewives/not working (40.0%). The mean number of individuals per household was 4.79 $\pm$ 1.86 with majority of them had a household size of 3 to 5 persons (57.7%), and had household monthly income of more than RM3500 (54%). The descriptive characteristics of the respondents were summarized in Table 2.

Table 2 Socio-demographic characteristics of the respondents

Characteristics	Husbands (n=150)		Wives (n=150)	
	n (%)	Mean ± SD	n (%)	Mean ± SD
Age of respondent		43.33 ± 11.16		**41.28 ± 10.93**
20 – 29 Years	16 (10.7)		25 (16.7)	
30 – 39 Years	41 (27.3)		41 (27.3)	
40 – 49 Years	45 (30.0)		48 (32.0)	
50 – 59 Years	48 (32.0)		36 (24.0)	
Educational level of respondent				
Primary education	4 (2.7)		2 (1.3)	
Secondary education	38 (25.3)		58 (38.7)	
Tertiary education and above	108 (71.9)		90 (60.0)	
Occupation of respondents*				
Managers	12 (8.0)		1 (0.7)	
Professionals	45 (30.0)		33 (22.0)	
Technician & Associate Professionals	29 (19.3)		4 (2.7)	
Clerical Support Workers	7 (4.7)		19 (12.7)	
Service & Sales Workers	29 (19.3)		17 (11.3)	
Plant & Machine Operator and Assembler	4 (2.7)		6 (4.0)	
Elementary Occupations	2 (1.3)		2 (1.3)	
Pensioners	20 (13.3)		8 (5.3)	
Not working/Housewives	2 (1.3)		60 (40.0)	
Household size**		4.79 ± 1.86		-
< 3	31 (10.3)			-
3 – 5	173 (57.7)			-
6 – 8	85 (28.3)			-
> 8	11 (3.7)			-
Household Income (RM)**		5746.84 ± 4779.86		
Less than RM1500	19 (6.3)			-
RM1500 - RM3500	119 (39.7)			-
More than RM3500	162 (54.0)			-

All respondents were Malays

*Classification of occupation was based on the Malaysia Standard Classification of Occupations 2008 (MASCO-08)

**Household income and size were based on mean overall respondents (husbands and wives are in the same households)

Results showed that the mean DQI-R scores of husbands and wives were 67.8 ± 9.1 and 64.4 ± 9.3 respectively out of a possible 100 points as shown in Table 3. There was a significant different in DQI-R scores between husbands and wives ($p < 0.001$). This result suggested that DQI-R scores differed between husbands and wives, even though they come from the same household. Results showed that those who achieved DQI-R scores exceeding 80 had the lowest percent of energy derived from fat regardless of gender (husbands = 22.6%, wives = 23.5%), compared to other groups; whereas husbands and wives that had the lowest score for DQI-R were the ones that had the highest percent of energy derived from fat (husbands = 34.5%, wives = 38.8%) (Figure 1 and Figure 2). There was a negative correlation between DQI-R scores and percent of energy derived from fat for husbands ($r = -0.372$, $n = 150$, $p < 0.000$) and wives ($r = -0.234$, $n = 150$, $p < 0.004$) as shown in Figure 1. Higher in DQI-R scores were correlated with lower percent energy derived from fat for husbands and wives. The wives had higher percent energy from fat compared to husbands for each score category.

Table 3 Mean values of Diet Quality Index Revised (DQI-R) components for husbands and wives

DQI-R COMPONENTS	HUSBANDS	WIVES
	Mean ± SD	Mean ± SD
Number of subjects (%)	150 (100.0)	150 (100.0)
% Energy from fat	28.6 ± 5.8	29.7 ± 6.2
% Energy from saturated fat	4.3 ± 2.8	4.9 ± 3.1
Dietary cholesterol (mg)	208.3 ± 165.6	187.8 ± 150.7
% Recommended servings of fruit per day	59.6 ± 49.9	49.7 ± 42.4
% Recommended servings of vegetables per day	69.7 ± 61.0	68.3 ± 52.2
% Recommended servings grains per day	110.4 ± 41.1	97.3 ± 34.8
% Calcium per day[a]	76.1 ± 39.6	73.0 ± 35.7
% Iron per day[a]	281.4 ± 150.6	162.3 ± 135.7
Dietary diversity (scale=0-10)	2.3 ± 1.5	2.6 ± 1.6
Dietary moderation (scale=0-10)	8.57 ± 1.1	8.7 ± 1.2
Mean DQI-R score	67.8 ± 9.1	64.4 + 9.3

[a]According to Malaysia Recommended Nutrient Intake (RNI)

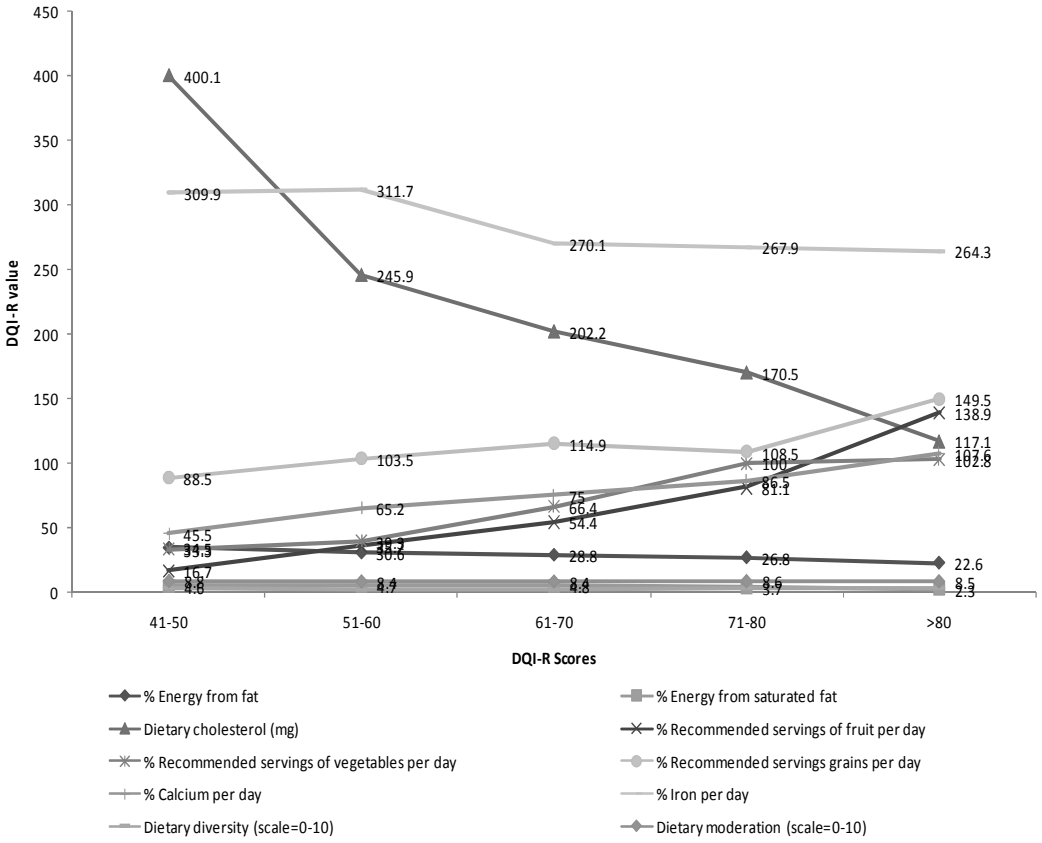

Figure 1 Mean values of Diet Quality Index Revised (DQI-R) components by DQI-R score category for husbands

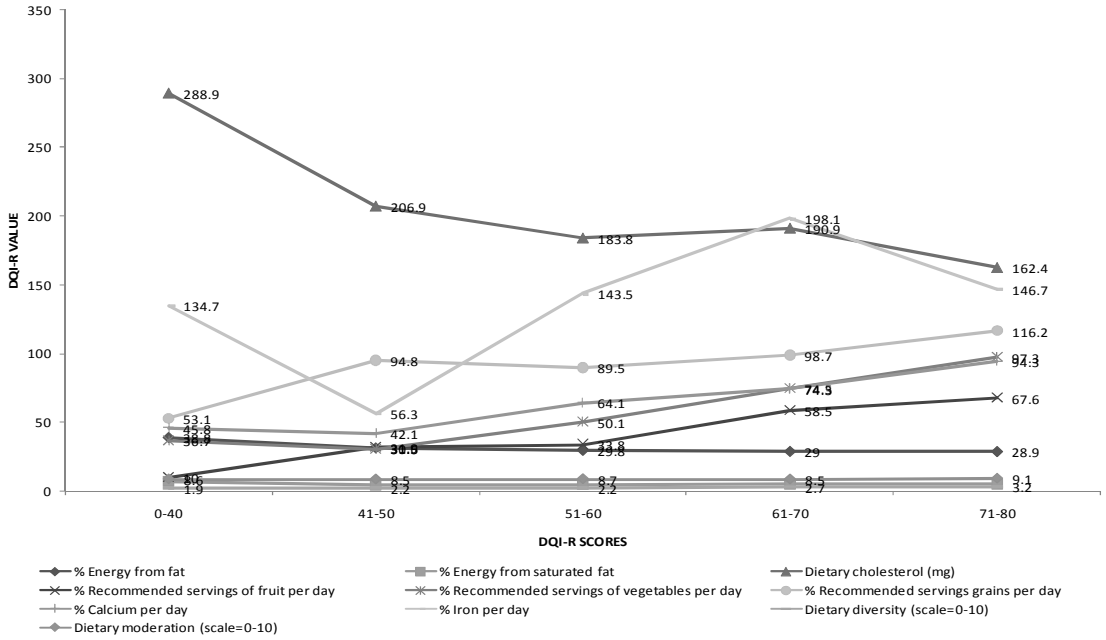

Figure 2 Mean values of Diet Quality Index Revised (DQI-R) components by DQI-R score category for wives

Similarly, those with DQI-R scores of more than 80 also had low saturated fat intake (husbands = 2.3%, wives = 3.1%) and dietary cholesterol (husbands = 117.1mg, wives = 281.6mg) intake compared to those with DQI-R scores below 50 for husbands and below 40 for wives. Mean percent energy from saturated fat for husbands is 4.3% $\pm$ 2.8 and wives 4.9% $\pm$ 3.1 which fulfills the recommended nutrient intake as the saturated fat should be less than or equal to 10% of energy intake. Both husbands and wives that achieved DQI-R scores of more than 80 had the most adequate level of fruit intake (husbands = 138.9%, wives = 100.0%) and vegetable intake (husbands = 102.8%, wives = 158.3%) as recommended in the Malaysian Dietary Guidelines [16]. As expected, those with lowest score of DQI-R had low intake of fruits (husbands = 16.7%, wives = 10.0%; % recommended servings of fruit per day) and vegetables (husbands = 33.3%, wives = 36.7%; percent recommended servings of vegetables per day) which were less than the recommended intake of servings. There were positive correlations between DQI-R scores, intake of fruits and vegetables for husbands (fruits; $r = 0.513$, $n = 150$, $p < 0.001$, vegetables; $r = 0.400$, $n = 150$, $p < 0.001$) and wives (fruits; $r = 0.358$, $n = 150$, $p < 0.001$, vegetables; $r = 0.405$, $n = 150$, $p < 0.001$). As the DQI-R scores rose, the intake of fruits and vegetables were also increased. Unfortunately, only husbands managed to get the most adequate level of grains (149.5%) as recommended while wives in the same score group (DQI-R scores >80) had only achieved 93.8% of the recommended servings. However, there was a positive correlation between DQI-R scores and levels of grain for wives ($r = 0.341$, $n = 150$, $p < 0.001$). As the DQI-R scores increased, level of grains grew up.

Mean percent of calcium intake per day for husbands and wives is 76.1% $\pm$ 39.6 and 73.0% $\pm$ 35.7 respectively. Husbands and wives that exceeded 80 for DQI-R scores had the largest percent of recommended nutrient intake for calcium (husbands = 107.6%, wives = 150.7%). On the other hand, husbands and wives who scored the lowest DQI-R scores had only 45.5% and 45.8% of recommended calcium intake per day respectively. There was a positive correlation between DQI-R scores and calcium intake for husbands ($r = 0.349$, $n = 150$, $p < 0.001$) and wives ($r = 0.379$, $n = 150$, $p < 0.001$). As calcium intake increased, DQI-R scores also increased for both husbands and wives. However, iron intake did not sow the same correlation pattern towards the DQI-R scores as shown by calcium intake. Husbands achieved more than 100% of recommended iron intake regardless of any

DQI-R scores category with a mean value of 281.4% ± 150.6. Wives also met the iron requirement for each of DQI-R scores category except for the DQI-R score category between 41 and 50 with percentage of iron intake at only 56.3%. Mean dietary diversity scores with a scale from 0 to 10 were only 2.3 ± 1.5 and 2.6 ± 1.6 achieved by both husbands and wives respectively. The highest diversity score for husbands who exceeded 80 for DQI-R scores was 2.9 out of 10 while the highest score for wives who obtained 71 to 80 DQI-R scores was 3.2. On the other hand, mean dietary moderation score with a scale from 0 to 10 was 8.57 ± 1.1 and 8.7 ± 1.2 for husbands and wives respectively. This reflected a mean sugar intake of 33.7 ± 26.4 g and 31.5 ± 24.5 g for husbands and wives respectively, 20.9 ± 13.2 g and 19.7 ± 11.6 g of discretionary fat, and also, 3064.6 ± 2183.0 mg and 2670.8 ± 998.9 mg of sodium intake. Since all the respondents were Malays and do not consume any alcohol, full scores were given for alcohol intake element. Dietary moderation score for wives that achieved DQI-R score more than 80 (score = 10.0) was higher than those below 40 (score = 8.6). Unfortunately, this does not apply for the husbands; where the highest dietary moderation score were among those with DQI-R scores between 41 and 50. There was a positive correlation between DQI-R scores and dietary moderation scores for husbands ($r = 0.200$, $n = 150$, $p = 0.014$) and wives ($r = 0.180$, $n = 150$, $p = 0.028$). Higher in DQI-R scores was correlated with higher in dietary moderation scores for husbands and wives.

DISCUSSION

This study was set out with the aim of assessing the diet quality of husbands and wives in a selected urban area using the DQI-R. In general, the diet quality of this study population was not satisfactory. The results corroborated the findings of the previous work [13, 20-22]. The differences in diet quality of husbands and wives did reach statistical significance with mean DQI-R scores of 67.8 ± 9.1 and 64.4 ± 9.3 respectively indicates the need to improve the quality of the diet. Diet quality of husbands was found to be slightly better compared to that of their wives in this study. Although this result differed from some published studies [23, 24], it was consistent with the Malaysian Adult Nutrition Survey (MANS) where males had higher nutrient intake and percent achievement of RNI than females [25]. Malaysian Adult Nutrition Survey (MANS), the first and largest nutrition survey in Malaysia conducted among 6886 adults aged between 18 and 59 years, was the recent data available to be compared with the present study. To our knowledge, no recent published data on diet quality of husbands and wives was found in Malaysia. Schafer and colleagues [7] in their study found that husbands who had confidence in their wives' decisions regarding the selection and preparation of food had a higher diet quality. Their findings suggested that wives play an influential role in their husband's dietary behavior whereas husbands have less influence on the wives' dietary intake. The finding was in agreement with Shattuck, White & Kristal [3] findings which showed that wives can influence husbands dietary intakes. It seems possible that the findings by Schafer et al. [7] may explain why husbands' diet quality is higher in this present study. Another possible explanation for this is that the educational level [19, 26], income [26, 27], nutritional knowledge [28], frequently eat food prepared at home [29] may influenced the husbands diet quality. Age also contributed to the diet quality of the husbands. Study done by Toft and colleague [30] among 6542 men and women aged 30–60 years found that there was a positive association between age and diet quality using diet quality score (DQS). Another study conducted by Quatromoni and colleagues [31] among 2245 adult men and women (aged from 49 to 56 years) also proved that men who achieved higher dietary quality tended to be older. There are, however, other possible explanations. Bardo [32] debated that most women who can afford to eat well are dieting and hungry almost all of the time which may affect the diet quality. Thus, diet quality of wives may decrease compared to that of their husbands.

Mean scores were higher for the fruit, vegetables, grains, calcium and iron intake among the husbands compared to the wives. On the other hand, mean scores of fat, saturated fat, cholesterol, diversity, and moderation components were higher among the wives than the husbands. Previous studies found that higher fruit and vegetable intake were more correlated with women compared to men [33-36]. This is because women have been found to be more conscious of diet and health issues and embraced dietary change to a better degree than men [37]. A study done by Wolf et al. [38] showed that fruit and vegetable consumption is low in a sample of urban and mostly immigrant black men. MANS study also depicts that the prevalence of green leafy vegetables consumed daily was slightly higher among women (41.6%) than that of men (38.2%) [39]. In contrast to those studies, results

of this study may be explained by the fact that the wives bear responsibility for nourishing their family and often do not adequately nourished themselves as explained by Allen and Sachs [6]. Asian women tend to give priority to their family first in terms of food intake especially foods that are considered to be "healthy foods" including rice, meat, fruits and vegetables. Hence, it could conceivably explain why husbands' intake of fruit, vegetables, calcium and iron were higher than the wives in this study. There are similarities between the higher grains intake among the husbands in this study and that described by Nasreddine et al. [34]. Nasreddine et al. [34] conducted a study among a sample of 444 adult subjects aged 25–54 years in Beirut and found that the intake of grains were significantly higher in men compared to women. The overall mean of calcium intake of wives was slightly lower than that of the husbands in this study. However, the findings of this study were not comparable to the results found in MANS study. A total of 6,742 subjects comprising 3,274 men and 3,468 women of adults aged 18 to 59 years in the Malaysian Adults Nutrition Survey (MANS) found that more women consumed full cream milk than men [39]. The result of this study may be explained by the fact that a small sample size was used and only comprising of one ethnic group (Malays). Iron intake was higher in the husbands than the wives in this study. This finding is consistent with MANS study which found mean iron intake was lower in women than in men [25].

Within the moderation score, majority of husbands and wives met recommendations for sugar and discretionary fat intake but not for sodium intake. Husbands had higher sodium intake than the wives. This finding supported MANS study that reported men in the urban area consumed more sodium (salt) than the women which were 2847 mg and 2346 mg respectively [25]. Moderation score in this study were higher than the diversity score. This result was similar with a study done by Popkin et al. [19] among 9241 respondents from the 1994–1996 Continuing Survey of Food Intake by Individuals aged $\geq$ 18 years , which showed that their moderation scores were higher than the diversity score. The results also showed that the total energy from fat, saturated fat and dietary cholesterol were inversely related to DQI-R scores while fruits, vegetables, grains, iron, and calcium intake were positively associated with DQI-R scores. These findings were consistent with those of Haines, et al., [13] and Newby, et al.,[22].

However, with a small sample size, caution must be applied, as the findings might not be transferable to other studies. The subjects chosen did not represent other areas and other ethnic groups in Malaysia as the subjects consisted of only the Malays living in an urban setting in Selangor, Malaysia.

CONCLUSION

Dietary quality of husbands and wives in this selected urban area needed to be improved especially on fruits, vegetables, and calcium intake as well as in the dietary diversity. Some of the issues emerging from this finding related specifically to increasing the fruits, vegetables, calcium intake and to increase diet diversity regardless of gender, as all those components were still considered to be not satisfactory even though husbands' diet quality scored better than the wives. Higher DQI-R scores in this study were characterized by reduced intake of fat, saturated fat and dietary cholesterol, along with higher intakes of fruit, vegetables, calcium, and iron intake. Even though living in the same household, the nutrient intake of husbands and wives do differs with one another. Therefore, wives' dietary quality does not reflect the husbands' dietary quality and vice versa.

Since lack of studies have been carried out regarding the dietary quality assessment with specific indices in Malaysia; this study therefore may give an insight picture of individuals' diet quality as well as an urge towards the development of our own indices of diet quality. Diet quality indices aid to capture the overall diet quality which will not depend on single nutrient or food group only. Lastly, the baseline data can be used as a guideline to improve the intervention programs in the future. Besides, it can be used as a reference for the researchers who share the same research interest.

REFERENCES

1. Austin GE. Diet Quality in Older, Overweight, and Obese Adults with Knee Osteoarthritis (Master of Science). Wake Forest University. 2002.
2. Variyam JN, Blaylock J, Smallwood D, Basiotis PP. USDA's Healthy Eating Index and Nutrition Information. Washington, DC Economic Research Service/USDA; 1998.

3. Shattuck AL, White E, Kristal AR. How Women's Adopted Low-Fat Diets Affect Their Husbands. *American Journalof Public Health.* 1992; 82(9):1244-1250.
4. Schafer E, Schafer RB, Keith PM, Bose J. Self-Esteem and Fruit and Vegetable Intake in Women and Men. *Journal of Nutrition Education.* 1999; 31: 153-160.
5. Louk KR, Schafer E, Schafer RB, Keith P. Comparison of Dietary Intakes of Husbands and Wives. *Journal of Nutrition Education.* 1999;31: 145-152.
6. Allen P, Sachs C. Women and Food Chains: The Gendered Politics Of Food. *International Journal of Sociology of Food and Agriculture.* 2007; 15 (1).
7. Schafer RB, Schafer E, Dunbar M, Keith PM. Marital food interaction and dietary behavior. *Social Science & Medicine.* 1999; 48: 787-796.
8. Kourlaba G, Panagiotakos DB. Dietary quality indices and human health: A review. *Maturitas.* 2009; 62: 1-8.
9. Kant AK. Dietary Patterns and Health Outcomes. *Journal of American Dietetic Association.* 2004; 104: 615-635.
10. Kennedy ET, Ohls J, Carlson S, Fleming K. The Healthy Eating Index: design and applications. *Journal of American Dietetic Association.* 1995; 95: 1103-1108.
11. Patterson RE, Haines PS, Popkin BM. Diet quality index: capturing a multidimensional behavior. *Journal of American Dietetic Association*. 1994; 94: 57-64.
12. Guenther PM, Reedy J, Krebs-Smith SM, Reeve BB, Basiotis PP. Development and Evaluation of the Healthy Eating Index-2005: Technical Report: Center for Nutrition Policy and Promotion, U.S. Department of Agriculture; 2007.
13. Haines PS, Siega-Riz AM, Popkin BM. The Diet Quality Revised: A measurement instrument for populations. *Journal of American Dietetic Association.* 1999(99): 697-704.
14. Faul F, Erdfelder E, Lang A-G, Buchner A. G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods.* 2007; 39(2):175-191.
15. MOH. Food Consumption Statistics Of Malaysia 2002/2003: For Adult Population Aged 18 To 59 Years. Putrajaya, Malaysia: Family Health Development Division, Ministry of Health; 2006.
16. NCCFN. Malaysian Dietary Guidelines. 1999: National Coordinating Committee on Food and Nutrition, Ministry of Health Malaysia, Kuala Lumpur.
17. NCCFN Malaysia. Recommended Nutrient Intakes for Malaysia: Ministry of Health Malaysia; 2005.
18. Kantor LS. A dietary assessment of the US food supply: Comparing per capita food consumption with food guide pyramid serving recommendations. Economic Research Service/USDA; 13 July 2009 1998.
19. Popkin BM, Zizza C, Siega-Riz AM. Who Is Leading the Change? U.S. Dietary Quality Comparison Between 1965 and 1996. *American Journal of Preventive Medicine.* 2003; 25: 1-8.
20. Fung TT, McCullough ML, Newby P, et al. Diet-quality scores and plasma concentrations of markers of inflammation and endothelial dysfunction. *American Journal of Clinical Nutrition.* 2005; 82: 163-173.
21. Kim S, Haines PS, Siega-Riz AM, Popkin BM. The Diet Quality Index-International (DQI-I) Provides an Effective Tool for Cross-National Comparison of Diet Quality as Illustrated by China and the United States. *Journal of Nutrition.* 2003; 133: 3476-3484.
22. Newby P, Hu FB, Rimm EB, et al. Reproducibility and validity of the Diet Quality Index Revised as assessed by use of a food-frequency questionnaire. *American Journal of Clinical Nutrition.* 2003; 78: 941-949.
23. Brummett BH, Siegler IC, Day RS, Costa PT. Personality as a predictor of dietary quality in spouses during midlife. *Behavior Medicine.* . 2008; 34(1): 5-10.
24. Duffy P, Zizza C, Kinnucan H. Obesity, BMI, and Diet Quality: How does the South Measure Up? Paper presented at: Southern Agricultural Economics Association Annual Meeting January 31-February 3, 2009 2009; Atlanta, Georgia.
25. Kandiah M, Zalilah MS, Safiah MY, et al. Energy and Nutrient Intakes: Findings from the Malaysian Adult Nutrition Survey (MANS). *Malaysia Journal of Nutrition.* 2008; 14(1): 1-24.
26. Beydoun MA, Wang Y. Do nutrition knowledge and beliefs modify the association of socio-economic factors and diet quality among US adults? *Preventive Medicine.* 2008; 46: 145-153.

27. Darmon N, Drewnowski A. Does social class predict diet quality? *American Society for Nutrition.* 2008; 87: 1107-1117.
28. Kant AK, Thompson FE. Measures of Overall Diet Quality from a Food Frequency Questionnaire: National Health Interview Survey 1992. *Nutrition Research.* 1997; 17(9):1443-1456.
29. Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food Preparation by Young Adults Is Associated with Better Diet Quality. *American Dietetic Association.* 2006; 106(12): 2001-2007.
30. Toft U, Kristoffersen L, Lau C, Borch-Johnsen K, Jørgensen T. The Dietary Quality Score: validation and association with cardiovascular risk factors: the Inter99 study. *European Journal of Clinical Nutrition.* 2007; 61: 270-278.
31. Quatromoni PA, Pencina M, Cobain MR, Jacques PF, D'Agostino RB. Dietary quality predicts adult weight gain: findings from the Framingham Offspring Study. *Obesity.* 2006; 14: 1383-1391.
32. Bordo S, ed. Hunger as Ideology Albany, NY State University of New York Press 1998. Scapp R, Sietz. B, eds. Eating Culture
33. Liebman M, Propst K, Mooreb SA, et al. Gender differences in selected dietary intakes and eating behaviors in rural communities in Wyoming, Montana, and Idaho. *Nutrition Research.* 2003; 23: 991-1002.
34. Nasreddine L, Hwalla N, Sibai A, Hamze´ Mn, Parent-Massin D. Food consumption patterns in an adult urban population in Beirut, Lebanon. *Public Health Nutrition.* 2006; 9(2):194-203.
35. Serdula MK, Coates RJ, Byers T, Simoes E, Mokdad AH, Slibat AF. Fruit and Vegetable Intake among Adults in 16 States: Results of a Brief Telephone Survey. *American Journal of Public Health.* 1995; 85: 236-239.
36. Blanck HM, Gillespie C, Kimmons JE, Seymour JD, Serdula MK. Trends in Fruit and Vegetable Consumption among U.S. Men and Women, 1994-2005. *Preventive Chronic Disease.* 2008; 5(2):1-10.
37. Hearty AP, McCarthy SN, Kearney JM, Gibney MJ. Relationship between attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. *Appetite.* 2007; 28: 1-11.
38. Wolf RL, Lepore SJ, Vandergrift JL, et al. Knowledge, Barriers, and Stage of Change as Correlates of Fruit and Vegetable Consumption among Urban and Mostly Immigrant Black Men. *Journal of American Dietetic Association.* 2008; 108: 1315-1322.
39. Norimah AK, Safiah M, Jamal K, et al. Food Consumption Patterns: Findings from the Malaysian Adult Nutrition Survey (MANS). *Malaysia Journal of Nutrition.* 2008; 14(1): 25-39.