Effects of dietary acculturation to Malaysian who migrate to the region of Riyadh, Saudi Arabia

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Abstract. Migration is a global phenomenon in modern world. The objective of this study was to evaluate the effects of dietary acculturation to Malaysians who migrate to the region of Riyadh, Saudi Arabia compared to their traditional dietary patterns in Malaysia. About 122 healthy Malaysians immigrating respondents were conveniently recruited for this study and their dietary patterns before and after migration were evaluated using specific self-administered questionnaire. All the data were then analyzed using the Statistical Package for the Social Sciences (SPSS) Windows program version 17.0. The results showed that the frequency of respondents who irregularly take their meals is increased from 9.8% (in Malaysia) to 41.8% (in Saudi Arabia). Before migration, about 95.1% to 98.4% of the respondents took their breakfast, lunch and dinner every day but after migration, only 52.5% to 86.9% of them took breakfast, lunch and dinner every day. All demographic factors which are; gender, marital status, age range, level of education, occupation in Saudi Arabia, length of stay in Saudi Arabia and factor of stay with whom in Saudi Arabia showed significant (P<0.05) effects on regularity of meals intake in Saudi Arabia. The study showed that Malaysian immigrants in Saudi Arabia affected with dietary acculturation.

1. Introduction

Migration is a natural global phenomenon. Peoples move from their indigenous country to other places for many reasons. Some migrate for economic reason while others being expatriates who work with transnational corporation or international organization. United Nation (1998) categorized a person who immigrates to a country other than that of his or her usual residence for a period of at least a year (12 months) as a long term immigrant.

Staying far away from indigenous country for a long term has many challenges. One of the challenges is dietary acculturation (Ana et al. 2006). It could be defined as an adjustment of traditional food intake which inhibited in immigrant from his or her original country and acceptance of culturally new dietary patterns in the new country (Norman et al. 2004). Cooper et al. (2007) explained that dietary acculturation has some positive health implications. Gordon-Larsen et al. (2003) and Varghese (2007) on the other hands reported many detriments which could lead to major changes in health status. Cantu (2008) said that the health status of immigrants becomes worsen after a long period of staying in the host country. Arkesh (2007), Antecol et al. (2006) and Huguet et al. (2004) reported that dietary acculturation process also related to a striking increase of BMI, overweight and obesity among immigrants. Alexander et al. (1999) have proved that high prevalence of Type II diabetes mellitus among immigrants were correlated to dietary acculturation. The incidence of cardiovascular diseases
also higher among immigrants who are more acculturated (Gordon-Larsen et al., 2003). Antecol et al. (2006) said that dietary acculturation might influence diet in ways that may not be obvious to outsiders.

According to Malaysia Embassy (2017) there are about 6,000 peoples from Malaysia migrating to several regions of Saudi Arabia. In Riyadh, it was estimated about 3,000 Malaysian living and working together with other Saudis citizens and immigrants. The information about the shifting of dietary patterns among immigrants is important to assess the adequacy of nutrients intake and for prevention of disparities health consequences. Thus, this study tried to explore the changes of new dietary patterns among Malaysians who migrate to the region of Riyadh, Saudi Arabia compared to their traditional dietary patterns in Malaysia.

2. Materials and Methods

2.1. Respondents
In this study, respondents were convenient randomly recruited from Malaysians who migrated to the region of Riyadh, Saudi Arabia. All the respondents were screened to ensure that they had not been diagnosed to have any health problems before and after migration. They were also asked to complete the consent form before answering the questionnaire to ensure that the study was conducted in voluntary basis where the respondents may withdraw at any time and the data collected will be held in a strictest confidence.

2.2. Questionnaire
All the respondents were given a self-administered questionnaire either in English or Malay language. They were guided by the researcher if they have any problem to answer the question. The four-part questionnaire contained questions about demographic characteristics of the respondent (Part A), pattern of meals intake before and after migration (Part B), pattern of water intake before and after immigration (Part C) and pattern of food preparation and food choice in Malaysia and in Saudi Arabia (Part D). The questionnaires were pre-tested by 16 voluntary Malaysian immigrants and the questions in the questionnaire were adjusted accordingly to ensure the respondents understand the questions and able to answer without prejudice.

2.3. Data analysis
All data collected were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) Windows program version 17.0. Frequency data were frequently reported in percentage or as mean ± standard deviation value. For t-tests and ANOVA, P value of 0.05 or less was considered statistically significant.

3. Results and Discussion

3.1. Demographic characteristics
A total of 122 respondents were participated in this study where 63 (51.6%) respondents were male and another 59 (48.4%) respondents were female (Table 1).

For male respondents, there were about 31 bachelors and 32 were married while for female respondents, there were 25 bachelors and 34 were married. Thus a total respondents consisted of 56 (45.9%) bachelors and 66 (54.1%) married. The distributions of respondents were normal according to their gender and marital status with skewness value of 0.07±0.22 and -0.17±0.22 respectively.

Table 1 also showed the distribution of respondents with regard to their age groups which seemed that both male and female respondents slightly skewed toward younger age (positive skewness) with skewness value of 1.12±0.30 and 1.06±0.31 respectively. The mean value of age was 36.6±4.6 years old where the youngest respondent was 26 years old and the oldest was 55 years old.
Table 1. Demographic characteristics of respondents by gender.

| Background                  | Male (n=63) | Female (n=59) | Total (n=122) |
|-----------------------------|-------------|---------------|---------------|
| Marital status              |             |               |               |
| • Bachelor                  | 31          | 25            | 56            |
| • Married                   | 32          | 34            | 66            |
| Age groups (years)          |             |               |               |
| • 25-34                     | 27          | 28            | 55            |
| • 35-39                     | 18          | 20            | 38            |
| • 40-44                     | 16          | 6             | 22            |
| • 45-49                     | 1           | 5             | 6             |
| • 55-60                     | 1           | 0             | 1             |
| Educational level           |             |               |               |
| • Primary & Secondary School| 0           | 8             | 8             |
| • Diploma                   | 8           | 30            | 38            |
| • First Degree              | 51          | 21            | 72            |
| • PhD/Master                | 4           | 0             | 4             |
| Occupation in Malaysia      |             |               |               |
| • Work with Government      | 12          | 26            | 38            |
| • Work with Private         | 51          | 3             | 54            |
| • Housewife                 | 0           | 30            | 30            |
| Occupation in Saudi         |             |               |               |
| • Work with Government      | 12          | 19            | 31            |
| • Work with Private         | 51          | 8             | 59            |
| • Housewife                 | 0           | 32            | 32            |
| Length of stay in Saudi Arabia |         |               |               |
| • <6 months                 | 15          | 2             | 17            |
| • 6 months – 1 year         | 9           | 5             | 14            |
| • 1 – 3 years               | 39          | 52            | 91            |
| Stay with whom in Saudi?    |             |               |               |
| • Stay alone                | 19          | 11            | 30            |
| • Stay with other Malaysian friend/s | 24      | 16            | 40            |
| • Stay with wife/husband and children | 20 | 32            | 52            |

In term of educational level, all male respondents seemed to have higher educational level compared to female respondents where 4 (6.3%) of them have PhD or master degree, 51 (81.0%) have first degree and 8 (12.7%) have diploma. Female respondents were seemed to have lower educational level compared to male respondents where only 7 (11.9%) of them have first degrees, 38 (64.4%) have diploma and 14 (23.7%) have completed their education just at secondary school. Majority (81.0%) of the male respondents worked with private sectors in Saudi Arabia and 12 (19.0%) of them worked with Saudi government agencies. For female respondents, 3 (5.1%) of them worked with private sectors in Saudi Arabia, another 26 (44.1%) of them worked with Saudis’ government agencies and the other 30 (50.8%) were housewives.

The demographic characteristics of the respondents showed the trend that many young Malaysians immigrated to Saudi Arabia compared to old generation. Majority of the Malaysian immigrants in Saudi Arabia have high educational level and worked as professional workers or expatriates either with private sectors or government agencies. Male immigrants have higher education level compared to female immigrants where they worked as accountant, internal auditor, bank officer, computer expert, company’s manager, architect, engineer, and lecturer. Some of them worked with
telecommunication sectors, bank and investment companies, oil companies, construction companies, government and private universities and diplomatic quarters. Some of the female Malaysian immigrants worked in Saudi Arabia as nurse at hospital or clinic and the rest just accompanied their husband and stayed at home as housewives.

Table 1 also showed about 91 (74.6%) respondents stayed in Saudi Arabia between 1–3 years, 14 (11.5%) respondents stayed in Saudi Arabia between 6 months to 1 year and another 17 (13.9%) respondents stayed in Saudi Arabia less than 6 months (skewness value equal to -1.52±0.22). About 30 (24.6%) respondents stayed alone in Saudi Arabia, 40 (32.8%) respondents stayed with their Malaysian friend/s and 52 (42.6%) respondents stayed with their wife or husband and children (skewness value equal to -0.14±0.22).

Cross-tabulation analysis of the respondents (Table 2) showed that 8 married male respondents stayed alone in Saudi Arabia, 4 married male respondents stayed with Malaysian friend/s in Saudi Arabia, a married female respondent stayed alone in Saudi Arabia and a married female respondent also stayed with Malaysian friend/s in Saudi Arabia.

Length of residence factor was found to affect dietary acculturation as studied by Raj et al. (1999), Goel et al. (2004) and Huguet et al. (2004). In this study, it was shown that 74.6% of the respondents stayed in Saudi Arabia more than a year. It means that at least 74.6% of Malaysian who migrated to Saudi Arabia may facing the risk of health disparities.

The factor of with whom the immigrants staying also expected to affect the dietary pattern. Those who stay alone or stay with other Malaysian friend/s were expected to eat outside more than who stay with their wife/husband and children. There were about 24.6% and 32.8% of the respondents in this study stayed alone in Saudi Arabia and stayed with their Malaysian friend/s respectively. It means that about 57.4% of Malaysian who migrated to Saudi Arabia may also facing the risk of health disparities.

### 3.2 Pattern of meals intake

Figure 1 showed the frequency of respondents according to the regularity and irregularity of meals intake before and after they immigrated to Saudi Arabia respectively. Regular meals intake in this study mean that the respondent consistently took the main meals daily which consist of breakfast, lunch and dinner. On the other hand, irregular meals intake mean that the respondent always skipped at least one of the main meals daily or replace one of the main meals by snack.
**Figure 1.** Frequency of respondents according to the regularity of meals intake before and after immigration to Saudi Arabia.

**Table 3.** Frequency (%) of respondents according to meals and snacks intake before and after immigration to Saudi Arabia.

| Immigration | Meal & Snack | Rare/Neve  | 1-3X per week | 4-5X per week | Everyday |
|-------------|--------------|------------|---------------|---------------|----------|
| Before      | Breakfast    | 0.0        | 0.0           | 4.9           | 95.1     |
|             | Morning tea  | 36.1       | 40.2          | 21.3          | 2.5      |
|             | Lunch        | 0.0        | 0.0           | 1.6           | 98.4     |
|             | Afternoon tea| 32.0       | 43.4          | 21.3          | 3.3      |
|             | Dinner       | 0.0        | 0.0           | 4.9           | 95.1     |
|             | Supper       | 39.3       | 48.4          | 10.7          | 1.6      |
| After       | Breakfast    | 0.0        | 7.4           | 40.2          | 52.5     |
|             | Morning tea  | 16.4       | 31.1          | 41.0          | 11.5     |
|             | Lunch        | 0.8        | 0.0           | 20.5          | 78.7     |
|             | Afternoon tea| 32.0       | 30.3          | 36.9          | 0.8      |
|             | Dinner       | 0.0        | 4.1           | 9.0           | 86.9     |
|             | Supper       | 41.0       | 36.9          | 22.1          | 0.0      |
About 12 (9.8%) respondents said that they irregularly take their meals before they migrated to Saudi Arabia. After migration, 51 (41.8%) respondents said that they irregularly take their meals. It showed that the frequency of respondents who irregularly take their meals was increased after they migrated to Saudi Arabia. Sjoberg et al. (2003) found that irregular meals pattern will lead to poor nutrient intake.

Table 3 showed the pattern of meals and snacks intake of the respondents before and after they migrated to Saudi Arabia.

Before migration, about 95.1% to 98.4% of the respondents took their breakfast, lunch and dinner every day but after migration, only 52.5% to 86.9% of them took breakfast, lunch and dinner every day. About 1.6% to 4.9% of them took breakfast, lunch and dinner 4-5 times per week after migration. Some of the respondents were seen replacing their main meals by snacks after migration where about 0.0% to 11.5% of them took morning tea, afternoon tea and supper every day after migration, 22.1% to 41.0% of them took morning tea, afternoon tea and supper 4-5 times per week after migration and 30.3% to 36.9% of them also took morning tea, afternoon tea and supper 1-3 times per week after migration. These data confirmed the statement before where many respondents did not regularly take their meals after migrated to Saudi Arabia. The study conducted by Suzana et al. (2000) showed that 90% to 99% of elderly Malaysian consumed breakfast, lunch and dinner every day while Norimah & Kather (2003) found that 69% to 93% of Malaysian consumed breakfast, lunch and dinner everyday.

Table 4. Results of factor analysis that Influence meals intake regularity among respondents before and after migration to Saudi Arabia.

| Factors Before Immigration | F Value | Significant |
|----------------------------|---------|-------------|
| Gender                     | 10.582  | 0.02*       |
| Marital status             | 2.002   | 0.37        |
| Age range                  | 3.737   | 0.70        |
| Level of Education         | 0.995   | 0.32        |
| Occupation in Malaysia     | 6.528   | 0.01*       |

| Factors After Immigration  | F Value | Significant |
|----------------------------|---------|-------------|
| Gender                     | 4.633   | 0.04*       |
| Marital status             | 13.720  | 0.00*       |
| Age range                  | 3.770   | 0.02*       |
| Level of Education         | 3.110   | 0.03*       |
| Occupation in Saudi Arabia | 8.808   | 0.00*       |
| Length of stay in Saudi Arabia | 6.440 | 0.00*       |
| Stay with whom in Saudi Arabia | 13.414 | 0.00*       |

Indicator: * indicate significantly different between the mean Values of the factors at P≤0.05
Table 4 showed the results of factor analysis which influence the regularity of meals intake among respondents before and after they migrated to Saudi Arabia. Three factors have no significantly (P>0.05) affected the regularity of meals intake before respondents migrated to Saudi Arabia. After migrated to Saudi Arabia, all of the studied factors have significant (P<0.05) effect on consistency of meals intake.

Table 5 showed the results of factor analysis which influenced specific meals among respondents after they migrated to Saudi Arabia.

| Factors                  | Meal     | F Value | Significant |
|--------------------------|----------|---------|-------------|
| Gender                   | Breakfast| 7.685   | 0.01*       |
|                          | Am Snack | 2.650   | 0.11        |
|                          | Lunch    | 27.640  | 0.00*       |
|                          | Pm Snack | 14.344  | 0.00*       |
|                          | Dinner   | 10.395  | 0.00*       |
|                          | Supper   | 1.303   | 0.26        |
| Marital status           | Breakfast| 0.128   | 0.72        |
|                          | Am Snack | 1.659   | 0.20        |
|                          | Lunch    | 0.495   | 0.48        |
|                          | Pm Snack | 0.127   | 0.72        |
|                          | Dinner   | 1.016   | 0.32        |
|                          | Supper   | 0.132   | 0.72        |
| Level of Education       | Breakfast| 2.408   | 0.07        |
|                          | Am Snack | 9.067   | 0.00*       |
|                          | Lunch    | 5.281   | 0.00*       |
|                          | Pm Snack | 3.441   | 0.02*       |
|                          | Dinner   | 2.114   | 0.10        |
|                          | Supper   | 3.215   | 0.03*       |
| Occupation in Saudi Arabia| Breakfast| 6.015   | 0.00*       |
|                          | Am Snack | 3.596   | 0.03*       |
|                          | Lunch    | 11.473  | 0.00*       |
|                          | Pm Snack | 7.678   | 0.00*       |
|                          | Dinner   | 4.782   | 0.01*       |
|                          | Supper   | 0.562   | 0.57        |
| Length of stay in Saudi Arabia| Breakfast| 4.165   | 0.02*       |
|                          | Am Snack | 4.010   | 0.02*       |
|                          | Lunch    | 3.657   | 0.03*       |
|                          | Pm Snack | 2.838   | 0.06        |
|                          | Dinner   | 1.236   | 0.29        |
|                          | Supper   | 3.081   | 0.05*       |
| Stay with whom in Saudi Arabia| Breakfast| 0.528   | 0.59        |
|                          | Am Snack | 1.450   | 0.24        |
|                          | Lunch    | 0.483   | 0.62        |
|                          | Pm Snack | 0.781   | 0.46        |
|                          | Dinner   | 0.373   | 0.69        |
|                          | Supper   | 0.535   | 0.59        |

Indicator: * indicate no significantly different between the mean value within the factors at P≤0.05.

Table 6 showed the frequency of respondents according to the food groups in meals intake before and after migrated to Saudi Arabia. It was showed that after migrated to Saudi Arabia, more (23.7%
to 57.9%) respondents had taken bread, nut and bean, chicken, milk/dairy products, vegetables and fruits every day in their meals compared to 0.0% to 15.8% of them had the same food groups every day before migration. No respondent had fish, meat and egg every day in their meals after migration compared to 13.2% to 39.5% of them who had fish, meat and egg every day before migration. The intake of cereal also increased after migration where 5.3% of the respondents took cereal after migration compared to 0.0% before migration. Norimah et al. (2008) found that cooked rice, marine fish, green leafy vegetables, and sweetened condensed milk were consumed daily by Malaysian.

Table 7 showed the frequency of respondents according to the selected food in their snacks before and after migration to Saudi Arabia. It was showed that after migration the intake of plain bread, pie/cake, snack bar, candy, potato chips and ice cream were increased where 6.6% to 22.1% of the respondents took these foods after migration compared before migration. The intake of cereal seem not much different before and after migration but the intake of pizza was increased after migration where 54.1% of the respondents took pizza 1-3 times per week in their snacks compared to only 15.6% before migration. The intake of ‘Kueh’ (Malaysian traditional food) was seen drastically decreased after migration where only 0.8% of the respondents took this food in their snacks aftermigration compared to 82.0% of the respondents took ‘kueh’ 4-5 times per week in their snacks before migration. ‘Kueh’ normally could be found in the morning or evening snack whether at food stalls or restaurants. Some of Malaysians also prepare this food at their home. The study also found that 52.6% of the respondents totally prepared the snack foods at their home after immigration while the other 13.1% of the respondents purchased the snack foods from the markets and 44.3% of the respondents both prepared their snack foods at home and purchased from outside. About 88.5% of the respondents felt that the snack food in Saudi Arabia were different in term of their preparation compared with Malaysia’s snack foods and only 11.5% of the respondents felt that the snack foods in Saudi Arabia and in Malaysia were same in term of preparation and taste.

Table 6. Frequency (%) of respondents according to the food group in meal intakes before and after migration to Saudi Arabia.

| Migration | Food Group in Meal Intakes | Rare/ Never | 1-3X per week | 4-5X per week | Every day |
|-----------|---------------------------|-------------|----------------|---------------|-----------|
| Before    | Cereal                    | 65.8        | 34.2           | 0.0           | 0.0       |
|           | Bread                     | 44.7        | 31.6           | 18.4          | 5.3       |
|           | Nuts and bean             | 65.8        | 34.2           | 0.0           | 0.0       |
|           | Fish                      | 0.0         | 21.1           | 39.5          | 39.5      |
|           | Chicken                   | 2.6         | 60.5           | 26.3          | 10.5      |
|           | Meat                      | 18.4        | 52.6           | 15.8          | 13.2      |
|           | Eggs                      | 42.1        | 50.0           | 7.9           | 0.0       |
|           | Milk/dairy                | 63.2        | 26.3           | 0.0           | 10.5      |
|           | Vegetable                 | 26.3        | 44.7           | 18.4          | 10.5      |
|           | Fruits                    | 31.6        | 34.2           | 18.4          | 15.8      |
| After     | Cereal                    | 73.7        | 21.1           | 5.3           | 0.0       |
|           | Bread                     | 0.0         | 7.9            | 52.6          | 39.5      |
|           | Nuts and bean             | 15.8        | 50.0           | 10.5          | 23.7      |
|           | Fish                      | 68.4        | 31.6           | 0.0           | 0.0       |
|           | Chicken                   | 0.0         | 5.3            | 60.5          | 34.2      |
|           | Meat                      | 5.3         | 68.4           | 26.3          | 0.0       |
|           | Eggs                      | 0.0         | 76.3           | 23.7          | 0.0       |
|           | Milk/dairy                | 10.5        | 10.5           | 21.1          | 57.9      |
|           | Vegetable                 | 0.0         | 0.0            | 44.7          | 55.3      |
|           | Fruits                    | 0.0         | 0.0            | 73.7          | 26.3      |
Table 7. Frequency (%) of respondents according to kind of food in their snacks intake before and after immigration to Saudi Arabia

| Migration | Selected Food in Snacks | Frequency (%) |
|-----------|-------------------------|---------------|
|           |                         | Rare/Never    | 1-3X per week | 4-5X per week | Everyday |
| Before    | Plain Bread             | 34.4          | 48.4          | 17.2          | 0.0       |
|           | Cereal                  | 71.3          | 28.7          | 0.0           | 0.0       |
|           | Pie/Cake                | 69.7          | 9.0           | 21.3          | 0.0       |
|           | Pizza                   | 84.4          | 15.6          | 0.0           | 0.0       |
|           | ‘Kueh’                  | 0.0           | 18.0          | 82.0          | 0.0       |
|           | Snack Bar               | 67.2          | 16.4          | 16.4          | 0.0       |
|           | Candy                   | 77.0          | 11.5          | 11.5          | 0.0       |
|           | Potato Chips            | 73.8          | 18.9          | 7.4           | 0.0       |
|           | Ice Cream               | 75.4          | 18.0          | 6.6           | 0.0       |
|           | Yogurt                  | 44.3          | 32.0          | 9.0           | 14.8      |
| After     | Plain Bread             | 1.6           | 9.0           | 67.2          | 22.1      |
|           | Cereal                  | 78.7          | 21.3          | 0.0           | 0.0       |
|           | Pie/Cake                | 0.0           | 61.5          | 21.3          | 17.2      |
|           | Pizza                   | 45.9          | 54.1          | 0.0           | 0.0       |
|           | ‘Kueh’                  | 99.2          | 0.8           | 0.0           | 0.0       |
|           | Snack Bar               | 56.6          | 1.6           | 26.2          | 15.6      |
|           | Candy                   | 43.4          | 3.3           | 39.3          | 13.9      |
|           | Potato Chips            | 68.0          | 10.7          | 14.8          | 6.6       |
|           | Ice Cream               | 0.0           | 63.1          | 20.5          | 16.4      |
|           | Yogurt                  | 23.0          | 19.7          | 57.4          | 0.0       |

4. Conclusion
The study showed that the frequency of respondents who irregularly take their meals is increased. Gender, marital status, age range, level of education, occupation in Saudi Arabia, length of stay in Saudi Arabia and factor of stay with whom in Saudi Arabia are among factors which effects on regularity of meals intake in Saudi Arabia. Dietary acculturation effects the food intake of Malaysian who migrated to Riyadh, Saudi Arabia.

References
[1] Ana F Abraído-Lanza, Adria N Armbrister, Karen R Flórez and Alejandra N Aguirre 2006 Toward a theory-driven model of acculturation in public health research American J. Public Health 96(8) 1342 –6
[2] Antecol H and Bedard K 2006 Unhealthy assimilation: why do immigrants converge to American health status levels? Demography 43 337 –61
[3] Akresh I 2007 Dietary assimilation and health among Hispanic immigrants to the United States J. Health Social Behav. 48 404 –17
[4] Alexander H, Harris M, Lockwood L and Melby C 1999 Risk factor for cardiovascular disease and diabetes in two groups of Hispanic Americans with differing dietary habits J. American College Nutr. 18 127 –36
[5] Cantu S 2008 Dietary Acculturation and Health Outcomes of Mexican Immigrants
[6] Cooper E, Himmelgreen D A, Martinez D and Romero N 2007 “I don’t make the soups anymore”: pre- to post-migration dietary and lifestyle changes among Latinos living in west-central Florida Ecol. Food Nutr. 46 427444
[7] Goel M S, McCarthy E P, Phillips R S and Wee C C 2004 Obesity among U.S. immigrant subgroups by duration of residence *JAMA* **292** 2860–7

[8] Gordon-Larsen P, Mullan-Harris K, Popkin B and Ward D 2003 Acculturation and overweight-related behaviors among Hispanic immigrants to the US *Social Sci. Med.* **57** 2023–34

[9] Huguet N, Kaplan M, McFarland B and Newsom J 2004 The association between length of residence and obesity among Hispanic immigrants *American J. Preventive Med.* **27** 323–26

[10] Malaysia Embassy 2017 Personal communication with second secretary to Malaysia ambassador. Riyadh: Communicated on October, 11 2017

[11] Norimah A Karim and Haja Mohaideen Myden Kather 2003 Nutritional status and food habits of middle-aged adults in selected areas of Selangor *Mal. J. Nutr.* **9**(2) 12–36

[12] Norimah A K, Safiah M, Jamal K, Siti Haslinda, Zuhaida H, Rohaida S, Fatimah S, Siti Norazlin, Poh B K, Kandiah M, Zalilah M S, Wan Manan W M, Fatimah S and Azmi M Y 2008 Food consumption patterns: findings from the malaysian adult nutrition survey (MANS) *Mal. J. Nutr.* **14**(1) 25–39

[13] Norman S, Castro C, Albright C and Abby King A 2004 Comparing acculturation models in evaluating dietary habits among low-income hispanic women *Ethnicity & Disease* **14**

[14] Raj S, Ganganna P and Bowering J 1999 Dietary habits of Asian Indians in relation to length of residence in the United States *J. Am. Diet Assoc.* 1106–08

[15] Suzana S, Earland J and Suriah A R 2000 Food Intakes and habits of rural elderly Malays *Asia Pacific Clin. Nutr.* **9**(2) 122–29

[16] United Nations 1998 *Recommendations on Statistics of International Migration*. New York