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Food choices among Malaysian adults: Findings from Malaysian Adults Nutrition Survey (MANS) 2003 and MANS 2014

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ABSTRACT

Introduction: Changes in dietary habits are known to be associated with changes in health outcomes. This study determined food choices among Malaysian adults using secondary data of the Malaysian Adults Nutrition Survey (MANS) in 2003 and MANS in 2014. **Methods:** A total of 6,742 and 3,000 adults aged 18 to 59 years participated in MANS 2003 and MANS 2014, respectively. Both studies used a semi-quantitative food frequency questionnaire (FFQ) to assess habitual food intake. **Results**: Overall, the prevalence of adults consuming rice twice daily were 97.3% and 86.9% in 2003 and 2014, respectively. While the percentage of urban dwellers who consumed rice daily differed significantly between 2003 (96.7%) and 2014 (86.9%), the percentage remained quite similar among rural adults in 2003 (97.8%) and 2014 (96.3%). Other top ten food items consumed daily were sugar (2003, 58.5% vs 2014, 55.9%), marine fish (40.8% vs 29.4%), green leafy vegetables (39.9% vs 43.2%) and sweetened condensed milk (35.2% vs 29.3%). In both surveys, a higher percentage of men consumed rice, sugar and sweetened condensed milk on a daily basis compared to women, a higher proportion of whom daily consumed green leafy vegetables and marine fish. Majority of the adults reported drinking plain water daily. Other beverages taken daily were tea, coffee and chocolate-malt drinks. **Conclusion:** Rice, sugar and sweetened condensed milk were among the top food items consumed daily in 2003 and 2014. Educational efforts to improve dietary intake of Malaysian adults is recommended.

Keywords: Dietary, food consumption, Malaysian Adults Nutrition Survey (MANS)

INTRODUCTION

Malaysia is known for its multi-cultural people and foods. With the emerging multimedia technologies in food marketing, it influences the food choice decisions among Malaysian consumers especially adults. Eating habits play a very important role in determining one's health status and level of morbidity of diseases occurring in a population because whatever food that we consume, it will impact our well-being (Francesco, Jessica & Emile, 2011).

Food choices are known to be associated with general health and the

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rapid socio-economic growth in Malaysia has influenced the lifestyle of Malaysian people. It was closely linked to the awareness of people towards healthy food intake as one of the best methods to improve health and well-being of the body in spite of reduced risk of specific diseases. Anyway, the number of consumers who believed that food can contribute directly to their health and well-being has increased all over the world (Golnaz *et al.*, 2012). Similarly, to Malaysians, they also felt the same due to a rapid change in consumer's preference towards changes in food choices, consumer's lifestyle and food consumption patterns (Golnaz *et al.*, 2012).

Agricultural practises have changed over the past 50 years and have seen increases in productivity, greater diversity of foods and less seasonal dependence. Food availability also increased as a consequence of raising the income levels of the consumers (Kearny, 2010). Similar to food choices, changes in dietary habits are known to be associated with changes in health status and may increase the prevalence of chronic diseases. Therefore, it is advisable to take a balanced diet every day and practice physical exercise despite having access to sources of adequate, nutritious, safe and good quality foods. The National Plan of Action for Nutrition Malaysia (NPANM) 2006-2015 was developed to provide nutrition knowledge and guidance on choosing the right and healthy food among the Malaysian population.

This paper examines the food choices among Malaysian adults from 2003 to 2014 using secondary data from Malaysian Adults Nutrition Survey 2003 (MANS 2003) (Institute for Public Health, 2003) and Malaysian Adults Nutrition Survey 2014 (MANS 2014) (Institute for Public Health, 2014).

MATERIALS AND METHODS

This is a retrospective study using secondary data from MANS 2003 and 2014. Both studies were nationwide cross-sectional studies which were carried out by the Institute for Public Health (IPH), Ministry of Health Malaysia. Geographically, both surveys covered the whole of Malaysia, both urban and rural areas. It covered only households living in private Living Quarters (LQs) which was divided into several Enumeration Blocks (EBs). An EB is a geographical continuous area with identified boundaries which contained between 80 to 120 LQs with an average population of 500 to 600 people.

The sampling frame was provided by the Department of Statistics (DOS), Malaysia. Multi-stage stratified cluster sampling was adopted as sampling method. A stratified random sampling with proportional allocation was used for both surveys which covered six zones in Malaysia such as Southern, Central, East Coast and Northern zones of Peninsular Malaysia, Sabah and Sarawak. A total of 6,742 and 3,000 adults aged 18 to 59 years were recruited in MANS 2003 and MANS 2014 respectively (IPH, 2003; IPH 2014). The first stage units of sample selection were the EBs while the second stage units were the LQs within the selected EBs. Random probability sampling was used to select LQs from each selected EBs and twelve LQS were selected from each selected EBs. The selection of LQs was also done by DOS, Malaysia.

Both studies used a semi-quantitative food frequency questionnaire (FFQ) to assess dietary behaviour among adults in Malaysia. The FFQs were developed and pre-tested in bi-lingual (Bahasa Malaysia and English). The FFQs consisted of more than 100 food items which were listed according to food groups and were administered

by interviewers through face-to-face interview, where respondents were asked to recall the frequency of intake of each listed food item by day, week or month. There were four main columns in the FFQ. The first column contained list of food items, second column described the frequency of intake by day, week or month, third column described the serving size of each food item such as cup, slices, pieces, spoon and so on, and the fourth column described the number of servings consumed each time the food item was eaten.

The only difference in the two surveys was that MANS 2003 used FFQ that comprised 13 food groups with 126 food items whereas MANS 2014 used the same FFQ but upgraded to 14 food groups with 165 food items (IPH, 2003; IPH 2014). The additional food group in MANS 2014 was fast food which consists of 8 food items such as burger, pizza, potatoes, sausage and so on. In MANS 2003, all the fast foods were in the group of meat and meat product. Besides, MANS 2014 added some food items in each groups such as brown rice and wholemeal bread in cereal product group, quail and internal organs in meat product group, snails, dried squid and its crackers in fish and seafood group, soy bean pudding in legumes product group, commercial milk in milk product group, tomatoes, brinjals and other vegetables, pickled fruits and many others in fruits group, pre-mixed drinks, herbals and botanic drink, chocolate bar, cream crackers and so on in confectionaries group, chocolate and garlic spread, and some additional in flavours group.

Respondents were also requested to report the number of serving(s) they consumed each time they eat the food. A food photo album describing the portion sizes of common Malaysian foods was specially developed and used in both surveys (MOH, 2004). It contains photographs of several locally available foods, either cooked or raw. Its purpose was to help the respondents to identify the types of food and the amount they eat during the interview session. These foods were shown in various serving sizes as mentioned above.

Both surveys were based on a complex, multistage sample design. Data analysis for these surveys took into account the complex survey design and the sample weights as well. Other than descriptive analysis, zeta test was used to produce the *z*-score to indicate significant changes among the top ten prevalence of food most consumed. The data was analysed using SPSS version 20 (SPSS IBM, New York, U.S.A) and STATA.

This survey (NMRR-12-815-13100) was reviewed and approved by the Medical Research and Ethics Committee, Ministry of Health Malaysia. All respondents were provided with information sheet and a copy of signed consent form. In the case of illiterate respondents, the information sheet and consent form were read to them and their thumb print was taken to replace written signature.

RESULTS

The prevalence and mean frequency of the top ten food items consumed daily by Malaysian adults in MANS 2003 and MANS 2014 are shown in Table 1. A high prevalence (97.2%) of Malaysian adults consumed white rice twice a day with an average of two plates (95% CI: 2.1, 2.2) per day in 2003. In 2014, white rice was consumed twice a day at a significantly lower prevalence of 89.8%, with an average of 2.5 plates (95% CI: 2.4, 2.6) daily. MANS 2003 showed that 58.5% of Malaysian adults consumed sugar with an average of four teaspoons per day, followed by marine fish (40.8%) and green leafy vegetables (39.9%). In 2014,

Table 1. Prevalence and mean frequency of the top ten food items consumed daily (MANS 2003 and MANS 2014)

MANS 2003				*MANS 2014*			
Food Items	*Prevalence (%)*	*Servings consumed per day (95% CI)*	*Intake per day (g)*	*Food Items*	*Prevalence (%)*	*Servings consumed per day (95% CI)*	*Intake per day (g)*
White rice	97.2	2.1 (2.1, 2.2) plates	210.0	White rice	89.8	2.5(2.4, 2.6) plates	250.0
Sugar	58.5	4.1 (3.9, 4.3) teaspoons	20.5	Sugar (white, brown, palm sugar)	55.9	3.7(3.4, 3.9) teaspoons	18.5
Marine fish	40.8	1.9 (1.8, 2.0) whole medium	201.4	Green leafy vegetables	43.2	5.9(5.6, 6.3) tablespoons	88.5
Green leafy vegetables	39.9	4.8 (4.7, 5.0) tablespoons	72.0	Marine fish	29.4	1.6(1.5, 1.7) whole medium	169.6
Sweetened condensed milk	35.3	2.8(2.7, 2.9) teaspoons	25.2	Chilies	24.2	1.8(1.6, 2.1) tablespoons	12.6
Powdered milk	17.1	3.1(3.0, 3.2) tablespoons	22.5	Condensed milk/creamer	23.5	2.7 (2.3, 3.0) tablespoons	24.3
Bread	17.1	3.3(3.1, 3.5) slices	94.1	Soy sauce	20.3	2.1(1.9, 2.3) teaspoons	17.8
Biscuit	16.3	4.8 (4.6, 5.0) pieces	36.8	Biscuit	13.8	4.8(4.3, 5.4) pieces	43.2
Traditional delicacies	14.5	2.3(2.2, 2.4) pieces	69.0	Condiment	14.6	2.4(2.1, 2.7) teaspoons	19.2
Hen eggs	12.1	1.7(1.2, 2.1) whole medium	91.8	Hen eggs	14.2	1.6(1.4, 1.8) pieces	86.4

Table 2. Prevalence and mean frequency of the top ten food items consumed daily according to sex (MANS 2003 and MANS 2014)

MANS 2003						*MANS 2014*					
Men			*Women*			*Men*			*Women*		
Food Items	*(%)*	*Mean Servings per day (95% CI)*	*Food Items*	*(%)*	*Mean Servings per day (95% CI)*	*Food Item*	*%*	*Mean Servings per day (95% CI)*	*Food Items*	*%*	*Mean Servings per day (95% CI)*
White rice	97.9	2.3 (2.2, 2.3) plates	White rice	96.4	2.0 (1.9, 2.0) plates	White rice	92.6	2.9 (2.7, 3.0) plates	White rice	86.8	2.0 (1.9, 2.1) plates
Sugar	59.9	4.4 (4.2, 4.6) teaspoons	Sugar	57.1	3.8 (3.6, 4.0) teaspoons	Sugar	58.2	4.0 (3.7, 4.4) teaspoons	Sugar	53.3	3.2 (2.8, 3.6) teaspoons
Sweetened condensed milk	42.6	3.1 (2.9, 3.2) teaspoons	Marine fish	41.8	1.8 (1.7, 1.9) whole medium	Green leafy vegetables	39.8	6.1 (5.6, 6.7) tablespoons	Green leafy vegetables	46.8	5.7 (5.3, 6.1) tablespoons
Marine fish	39.8	2.0 (1.9, 2.1) whole medium	Green leafy vegetables	41.6	4.8 (4.6, 5.0) tablespoons	Marine fish	28.3	1.7 (1.5, 1.8) whole medium	Marine fish	30.5	1.5 (1.4, 1.7) whole medium
Green leafy vegetables	38.2	5.0 (4.7, 5.3) tablespoons	Sweetened condensed milk	28.3	2.5 (2.3, 2.6) teaspoons	Sweetened condensed milk	26.2	3.0 (2.5, 3.5) teaspoons	Chilies	25.4	1.9 (1.5, 2.2) teaspoons
Bread	15.4	3.7 (3.3, 4.0) slices	Powdered milk	22.6	3.2 (3.0, 3.4) tablespoons	Chilies	23.1	1.8 (1.5, 2.1) teaspoons	Sweetened condensed milk	20.6	2.2 (2.0, 2.4) teaspoons
Traditional delicacies	15.4	2.4 (2.2, 2.6) pieces	Bread	18.8	3.0 (2.7, 3.3) slices	Soy sauce	21.0	2.2 (4.1, 6.5) teaspoons	Soy sauce	19.5	2.0 (4.1, 4.9) teaspoons
Hen eggs	14.7	1.9 (1.2, 2.6) whole medium	Traditional delicacies	13.6	2.2 (2.0, 2.4) pieces	Hen eggs	18.1	1.7 (1.4, 2.1) whole medium	Biscuits	17.9	4.5 (4.1, 4.9) pieces
Biscuits	12.5	5.4 (5.0, 5.8) pieces	Biscuits	13.6	4.4 (4.1, 4.6) pieces	Chicken meat	15.5	1.8 (1.5, 2.1) pieces	Condiment	14.4	2.4 (2.0, 2.8) teaspoons
Chicken meat	12.4	1.8 (1.6, 2.0) pieces	Anchovies	12.8	1.7 (1.6, 1.9) tablespoons	Condiment	14.8	2.4 (2.1, 2.8) teaspoons	Anchovies	13.0	1.5 (1.3, 1.6) tablespoons

Table 3. Prevalence and mean frequency of the top ten food items consumed daily by strata (MANS 2003 and MANS 2014)

MANS 2003						*MANS 2014*					
Urban			*Rural*			*Urban*			*Rural*		
Food Items	*(%)*	*Mean Servings per day (95% CI)*	*Food Items*	*(%)*	*Mean Servings per day (95% CI)*	*Food Item*	*%*	*Mean Servings per day (95% CI)*	*Food Items*	*%*	*Mean Servings per day (95% CI)*
White rice	96.7	2.0 (1.9, 2.1) plates	White rice	97.8	2.3(2.2, 2.4) plates	White rice	86.9	2.3 (2.2, 2.4) plates	White rice	96.3	2.9 (2.7, 3.0) plates
Sugar	51.4	3.5(3.4,3.7) teaspoons	Sugar	69.1	4.7 (4.5, 5.0) teaspoons	Sugar	50.5	3.4 (3.1, 3.8) teaspoons	Sugar	68.1	4.0 (3.5, 4.5) teaspoons
Green leafy vegetables	42.2	4.6 (4.4, 4.8) tablespoons	Marine fish	51.3	2.2(2.0, 2.3) whole medium	Green leafy vegetables	44.6	5.8 (5.3, 6.2) tablespoons	Marine fish	43.5	1.7 (1.6, 1.8) whole medium
Sweetened condensed milk	34.9	2.7 (2.5, 2.9) teaspoons	Green leafy vegetables	36.5	5.3(5.0, 5.7) tablespoons	Marine fish	23.6	1.5 (1.4, 1.7) teaspoons	Green leafy vegetables	39.9	6.3 (5.6, 7.1) tablespoons
Marine fish	33.6	1.7 (1.6, 1.8) whole medium	Sweetened condensed milk	36.5	3.0(2.9, 3.2) teaspoons	Chilies	23.5	1.9 (1.5, 2.2) teaspoons	Sweetened condensed milk	27.4	2.6 (2.4, 2.8) teaspoons
Bread	19.6	3.2 (2.9, 3.4) pieces	Traditional delicacies	19.7	2.3(2.1, 2.5) pieces	Sweetened condensed milk	21.8	2.7 (2.2, 3.2) teaspoons	Chilies	26.8	1.8 (1.4, 2.1) teaspoons
Powdered milk	18.5	3.2 (3.0, 3.4) tablespoons	Biscuits	18.6	5.0(4.8, 5.4) pieces	Soy sauce	20.2	2.0 (1.7, 2.2) teaspoons	Soy sauce	20.6	2.4 (1.9, 2.8) teaspoons
Biscuits	14.7	4.5 (4.2, 4.8) pieces	Anchovies	16.1	1.8 (1.7, 1.9) teaspoons	Chicken meat	14.3	1.8 (1.5, 2.0) pieces	Traditional delicacies	17.5	2.7 (2.4, 2.9) pieces
Chicken meat	12.0	1.7 (1.6, 1.9) pieces	Powdered milk	15.1	2.9 (2.7, 3.1) tablespoons	Hen eggs	14.1	1.5 (1.3, 1.7) whole medium	Condiment	16.8	2.7 (2.1, 3.3) teaspoons
Hen eggs	11.8	1.4 (1.3, 1.5) whole medium	Bread	13.4	3.6 (3.2, 4.0) pieces	Condiment	13.7	2.3 (1.9, 2.6) teaspoons	Anchovies	16.3	1.8 (1.6, 2.0) tablespoons

Table 4. Comparison of prevalence of food intake between MANS 2003 and MANS 2014

Food Items	*MANS 2003*		*MANS 2014*		*z-score*
	Prevalence (%)	*Standard error*	*Prevalence (%)*	*Standard error*	
White rice	97.20%	0.0028	89.80%	0.0090	-7.85***
Sugar	58.50%	0.0071	55.90%	0.0149	-1.58
Marine fish	40.80%	0.0069	29.40%	0.0146	-7.06***
Green leafy vegetables	39.90%	0.0070	43.20%	0.0148	2.02*
Sweetened condensed milk	35.30%	0.0070	23.50%	0.0114	-8.82***
Powdered milk	17.10%	0.0055	10.10%	0.0080	-7.21***
Bread	17.10%	0.0056	11.90%	0.0083	-5.19***
Biscuits	16.30%	0.0053	13.80%	0.0086	-2.47*
Traditional delicacies	14.50%	0.0048	12.10%	0.0089	-2.37*
Hen eggs	12.10%	0.0050	14.20%	0.0088	2.07*

Significant level for zeta test with *z*-score 1.96 **(p<0.05), **p<0.01 (2.576), ***p<0.001 (3.29)*

the prevalence of sugar consumption remained high (55.9%) among the Malaysian population, and a higher percentage of people consumed green leafy vegetables (43.2%) compared to marine fish (29.4%).

Other food items being consumed daily in 2003 by a smaller proportion of Malaysian adult population were sweetened condensed milk (35.3%), powdered milk (17.1%), bread (17.1%), biscuits (16.3%), traditional delicacies (14.5%), and hen eggs (12.1%). In 2014, 24.2% of Malaysian adults consumed chilies daily, followed by sweetened condensed milk (23.5%), soy sauce (20.3%), biscuits (13.8%), condiment (14.6%), and hen eggs (14.2%). All these food items were consumed at least once a day (Table 1).

Table 2 shows the prevalence and mean frequency of the top ten food items consumed daily by gender from MANS 2003 and MANS 2014. In 2003, the prevalence of white rice consumption was 97.9% among men and 96.4% among women, while 92.6% and 86.8% among men and women respectively in 2014. From 2003 to 2014, Malaysian adults consumed an average of two to three plates of white rice twice daily. More than half of the Malaysian population consumed sugar daily in MANS 2003, with a prevalence of 59.9% among men and 57.1% among women. In MANS 2014, the prevalence of sugar consumption was 58.2% and 53.3% among men and women respectively. A higher percentage of women consumed marine fish (41.8% vs 39.8%) and green leafy vegetables (41.6% vs 38.2%) daily compared to men in MANS 2003, while a higher percentage of men consumed sweetened condensed milk (42.6% vs 28.3%) daily compared to women in 2003. Similarly, in 2014, a higher percentage of women

consumed green leafy vegetables (46.8% vs 39.8%) and marine fish (30.5% vs 28.3%) daily compared to men. A higher percentage of men consumed sweetened condensed milk (26.2% vs 20.6%) daily compared to women in 2014. Other food items that are being consumed daily by both genders in 2014 were presented in Table 2.

The prevalence and the mean frequency of the top ten food items consumed daily by strata from MANS 2003 and MANS 2014 are shown in Table 3. Results showed that 96.7% of urban dwellers consumed white rice daily in MANS 2003 and the prevalence was 86.9% in 2014 (average 2-3 plates per day). The prevalence of white rice consumption among rural dwellers in 2003 and 2014 were 97.8% and 96.3% respectively. In both surveys, the prevalence of daily sugar consumption was higher among adults residing in rural areas (69.1% in MANS 2003 and 68.1% in MANS 2014) compared to those residing in urban areas (51.4% in MANS 2003 and 50.5% in MANS 2014). In 2003, 42.2% of adults from urban areas consumed green leafy vegetables daily, followed by sweetened condensed milk (34.9%), marine fish (33.6%) and so on. After 10 years in 2014, 44.6% of urban dwellers consumed green leafy vegetables daily, followed by marine fish (23.6%), chilies (23.5) and so on. From 2003 to 2014, approximately half of the Malaysian adult population who residing in rural areas consumed marine fish daily, with the prevalence of 51.3% in 2003 and 43.5% in 2014. Other food items that are being consumed daily by adults from rural areas in 2014 were presented in Table 3.

White rice, marine fish, sweetened condensed milk, powdered milk and bread showed significantly decreased among the top ten food items consumed. Malaysian adults demonstrated a good habit of drinking plain water daily, 99.0% in 2003 and 98.2% in 2014 (Table 4).

DISCUSSION

Both surveys portray that rice is the most important food crop and the primary source of food among Malaysians. Food is the basic human need of calories, which provides energy, nutrients and other requirements that are essential for growth and health (Wardle *et al.*, 2004). Both surveys found that Malaysian adults prefer sugar as the second choice of food intake in daily living to replace sweetened condensed milk. However, with awareness of less sugar intake, a significantly lower percentage of Malaysian people consumed sugar and sweetened condensed milk daily in MANS 2014. Both sugar and sweetened condensed milk are carbohydrates that provide high sugar level, which might increase the risk of overweight and may contribute to chronic diseases, including diabetes, hypertension and heart problems (Mohamad Asif, 2014). The increasing intake of foods with high sugar content is often seen as major factors contribute to the raising of obesity (Amarra, Khor & Chan, 2016). MANS 2014 reported that prevalence of overweight in Malaysia was 32.4% (95% CI: 29.9-35.1) which is increasing every year. In view of the perspective of nutrition, eating habits and food choices play a very important role to determine the health status and level of morbidity. It is clearly stated that whatever food we eat will have a direct impact on our health and existence of particular diseases (Mohamad Asif, 2014).

Majority of Malaysian adults consumed white rice twice a day with an average intake of 2.5 plates per day. Results showed that rice was the main food for Malaysians and normally rice was consumed during lunch and dinner. The lunch and dinner food patterns

in Malaysia consisted of rice and vegetables, plus either chicken or fish as a protein intake (Nur Indrawaty, Khor & Imelda, 2012). Previous study reported that *nasi lemak* was the first choice in terms of breakfast food for most of their participants both from the urban and rural areas in Malaysia (Nur Indrawaty *et al.*, 2012). Rice also becomes the primary ingredient in daily meals and source for traditional foods menu planning in Malaysia (Nur Hafizah *et al.*, 2013). Sometimes fried rice is also one of the dishes for breakfast among Malaysians and this indicates that rice is the main and first choice food in Malaysia. Rice is the staple food for all ASEAN countries.

From 1970 to 2009, the domestic utilisation of rice rose to more than 100% in all South-East Asia countries between the four decades. Thus, rice production needs to be scaled up to support the increasing needs of the growing population (Soon & Tee, 2014). In 2014, rice consumption significantly decreased, similarly with other food items such as marine fish, powdered milk and bread. However, Malaysian people still believed that energy intake derived much more from rice. Same as in Japan, although rice consumption has decreased over the past several years in Japan but 30% of energy intake of Japanese is still derived from rice (Nanri *et al.*, 2010). Besides white rice, results from both surveys showed that other food items such as sugar, green leafy vegetables and marine fish were commonly consumed either daily or weekly by Malaysian adults.

Food choices are important because they are basic necessity for human beings. The selection of food is closely linked to the awareness of people towards healthy food intake for improving well-being and reducing the risk of specific diseases. Furthermore, the absence of food and nutrition security may have significant effects such as malnutrition, obesity, diseases and poverty (Hammond & Dube, 2012). It should be noted that the occurrence of diseases or negative health outcomes is closely related to dietary habits among Malaysian adults where some of them practiced a balanced diet but some were not. People who have less nutrition knowledge may have unhealthy food choices in their daily life and will generate unhealthy life (Shridhar *et al.*, 2015). This global problem of consuming a large scale of unhealthy diet and its impact on human health needs to be emphasised. People should be educated to increase health awareness, limit consumption of unhealthy foods and practise healthy eating habits for a better living (Shridhar *et al.*, 2015).

Findings from MANS 2003 and MANS 2014 showed that mean frequencies for daily intake of white rice, sugar and sweetened condensed milk were significantly higher among men compared to women. Results showed that men consumed higher carbohydrates than women and this probably due to their height, weight, activity level, workload and their preference to eat. On the other hand, women consumed significantly higher servings of marine fish and green leafy vegetables compared to men. As a concern, women are more dissatisfied with their bodies and always concerned about their appearance as an influence on their feelings of well-being. It is noted that women desire to control their body weight and much more concern about health, thus they tend to choose healthier diet compared to men (Gaston & Adriana, 2007). In general, men usually prefer to have fewer high fibre foods, and fewer fruits and vegetables compared to women (Wardle *et al.*, 2004). However, both MANS 2003 and 2014 revealed that consumption of fruits is still low among Malaysian adults and it is not included in the top ten daily consumed foods. Similarly, in southern, central, eastern

European countries and Australia, fruits and vegetables consumption still remains below the recommended levels (Kearny, 2010).

The Malaysian Dietary Guidelines (2010) recommend a daily minimum intake of five servings of fruits and vegetables (approximately 400g) which are two servings for fruits and three servings for vegetables per day. Early this year, the Ministry of Health Malaysia advised all Malaysians to take more fruits and vegetables through the *'suku-suku separuh'* (Quarter Quarter Half, Malaysian Healthy Plate) campaign which divided the portions of a plate to a quarter for meat and fish, a quarter for grains and nuts and half for fruits and vegetables. Sufficient intake of fruits and vegetables has been related with reducing risk of chronic disease and body weight management (Pem & Jeewon, 2015).

Both surveys showed that a small proportion of men consumed chicken and eggs daily. This could be due to chicken and eggs being more affordable and easier to obtain from markets or stores as compared with other food items. In addition, men from urban areas indicated a higher consumption of cooked food and fast food than men from rural areas. These local fast foods are widely consumed in huge servings, many times a week and many of the office workers have their limited access to healthier choices around their work place (Soon & Tee, 2014). Nowadays, eating fast food is not only prevalent among adult population, but also commonly practiced among children. This indicates that children will have a high tendency to take unhealthy foods and drinks, which are known to have a high content of sugar, fats and salt (Totu, Oswald & Halik, 2013). In Malaysia, local fast foods are on sale literally everywhere throughout the day whether it is at the roadside hawker stalls to posh restaurants as well.

Findings from MANS 2003 and MANS 2014 showed that a small proportion of women consumed breads and biscuits daily. We postulated that the convenient, light packaging of crackers and their relatively longer shelf life compared with that of breads might be the reasons why women nowadays tend to choose biscuits for convenience and its longer storage time. It is also possible that they felt that by choosing the right types of biscuit, they would maintain their body weight by reducing their calorie and fat intake. Women were always found to have a better dietary intake compared to men especially in daily breakfast and meal frequency (Kremmyda *et al.*, 2008). Furthermore, women were found to choose eating more fruits, vegetables, cereals and breads to maintain their healthy food choices (Mikolajczyk, Ansari & Maxwell, 2009).

With regard to plain water intake, both surveys in 2003 and 2014 indicated that Malaysian adults habitually consumed six glasses of plain water daily and were considered meeting the recommended intake of plain water in terms of amount and frequency. It is well-known that water plays an extremely important role in our body. Our body is composed of about 60.0% of water which is functional as digestion, absorption, transportation of nutrient intake, and maintenance of body temperature. Drinking plain water is an effective way to provide adequate hydration without calories (Amstrong, 2010). Instead of caloric beverages, it also helps to reduce dietary energy density and may contribute to management of body weight. Water from beverages and foods is the key determinant of the energy density of the diet (Tate *et al.*, 2012). Results showed a good habit of water consumption among Malaysian adults over the 10-year period and this should be maintained for the overall good health and wellbeing of Malaysian population.

Other types of beverages such as tea, coffee and chocolate/malted drinks were also commonly consumed by Malaysian adults in 2003 and the percentages increased approximately 1.5 to 2 times higher in 2014. This may be due to socio-economic changes and expanding of beverage marketing practices which could influence the beverage preference of consumers.

Nutrition education is important to improve nutritional knowledge of the community especially in a developing country such as Malaysia to avoid lack of alert about the dietary requirements and nutritive value of different foods, which are crucial to prevent malnutrition among children, pregnant women and other vulnerable groups in the community. According to Kushi, Byers & Doylce (2006), lifestyle choices with respect to diet are very important in both primary and secondary prevention of chronic disease. In Malaysia, good socio-economic progress and rapid urbanisation has changed the lifestyle of the Malaysian population. These changes include eating habits and food choices which ultimately have an impact on health and disease patterns among the Malaysians. A balanced diet with optimal levels of physical activity is the foundation of health. Therefore, people must be given easy access to healthy foods, and being exposed to knowledge about healthy food choices which influenced them to choose the right and healthy diet (National Plan of Action for Nutrition of Malaysia, 2006-2015). Furthermore, establishing healthy and balanced dietary practices in younger population among children and adolescents is an important public health strategy to promote optimal nutritional status and to reduce the risk of non-communicable diseases (Abdullah, Teo & Foo, 2016).

CONCLUSION

MANS 2003 and MANS 2014 showed that a wide variety of food items were consumed daily and weekly by Malaysian adults. Majority of them consumed rice twice a day with an average intake of 2.5 plates per day. Malaysian adults showed a preference for sugar as the second most common choice of food consumed on a daily basis.

There are existing government guidelines and intervention programmes to promote healthy eating and healthy lifestyle among Malaysian adults. In light of the findings in this study, more efforts should be undertaken to instil more healthy food choices and dietary practices.

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Authors' contributions

Noraida MK was responsible for the preparation and drafted the manuscript, study conception, design, conduct, acquisition of subjects, data interpretation, drafting, critical revision and final approval of the manuscript; Mohamad Hasnan A and Balkish MN were responsible for the data entry, data analysis, data interpretation, critical revision and final approval of the manuscript; Azli BS was responsible for the study design, data interpretation critical revision and final approval of the manuscript; Chan YY and Tahir A were responsible for the data interpretation, critical revision, language and grammar and final approval of the manuscript. All authors approved the final manuscript.

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