The effect of the Malaysian Food Guideline guidance on a group of overweight and obese women during Ramadan

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ABSTRACT

الأهداف: الهدف من هذه الدراسة هو لتحديد تأثير انتشار المعرفة للإرشادات الغذاء الماليزية (MFG) على مجموعة من النساء اللاتي يعانين من زيادة الوزن أو السمنة المفرطة خلال شهر رمضان.

الطريقة: أجريت هذه الدراسة خلال شهر رمضان 2011م. وشارك في الدراسة مجموعة من 84 من النساء الماليزيات المسلمات مع مؤشر كتلة الجسم (BMI ≥25 كجم / متر مربع . لقد تم تثقيف المشاركات قبل شهر رمضان، تم تثقيف المشاركات حول الإرشادات الغذاء الماليزية وحول كيفية رصد وتسجيل الاستهلاك الغذائي اليومي للطعام. قبل شهر رمضان تم قياس كمية الطعام المتناول ، (مؤشر كتلة الجسم) ، ضغط الدم (BP)، فحص الدهون في الدم وتحليل سكر الصائم (FBS). فيما تم قياس كمية الطعام المتناولة وبعدها قيست مرة أخرى في الأسبوع الثالث. في حين تم تحديد مؤشر كتلة الجسم ، ضغط الدم ، فحص الدهون في الدم وتحليل سكر الصائم FBS في الأسبوع 4 من رمضان.

النتائج: في الأساس تمت مقارنة مع توصيات MFG ، والكمية المتناولة من البروتين والحليب ومنتجات الألبان كان أعلى (107.5% و 133%)، في حين كانت الكمية المتناولة من الكربوهيدرات والخضار والفواكة أقل (78.5% و 44.4%). خلال شهر رمضان انخفضت كمية تناول الكربوهيدرات، مؤشر كتلة الجسم ، HDL–C و (all p=0.000) LDL–C (FBS(P= 0.002؛ TG(P=0.005)؛) ولكن ارتفعت نسبة TC/HDL-C(0.000)=P .

الخاتمة: خلال شهر رمضان كانت نتائج المشاركات في برنامج زيادة الوعي بالإرشادات الغذاء الماليزية MFG إيجابية . هذه التغييرات يمكن أن تكون بداية جيدة لتحسن الصحة، شريطة أن تكون مستمرة ما بعد شهر رمضان.

Objectives: To determine the effect of imparting knowledge of the Malaysian Food Guideline (MFG) on a group of overweight and obese women during Ramadan.

Methods: This intervention study was conducted during the months of Ramadan 2011. A group of 84 Malay Muslim women with a body mass index (BMI) ≥25 kg/m^2 were recruited. Prior to Ramadan, the respondents were educated regarding MFG, and how to monitor and record their daily food intake in a food diary. Their quantity of food intake, BMI, blood pressure (BP), blood lipid profile, and fasting blood sugar (FBS) were measured before Ramadan as a baseline. Their quantity of food intake was then measured again in the third week, whereas their BMI, BP, blood lipid profile, and FBS were determined on the fourth week of Ramadan.

Results: At baseline, compared with the MFG recommendations, the intake of protein (107.5%), and milk and dairy products (133%) was higher, whereas the intake of carbohydrates (78.5%), and vegetables and fruits (44.4%) was lower. During Ramadan, carbohydrate intake, BMI, high density lipoprotein-cholesterol (HDL-C) and low density lipoprotein-cholesterol (LDL)-C (all p=0.000), triglyceride (p=0.005), and FBS (p=0.002) were reduced, but the TC/HDL-C ratio was increased (p=0.000).

Conclusion: A month-long Ramadan fast guided by the knowledge of MFG resulted in certain positive changes in this group of respondents. These changes can be a good start for health improvement, provided that they are followed-up after Ramadan.

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Dietary patterns are often influenced by religious practices. This is because most religions prescribe certain dietary patterns, standards and prohibitions.[1] For Muslims, dietary patterns markedly change during the month of Ramadan, when they observe a month-long, obligatory fasting period. During Ramadan, Muslims completely refrain from consuming any food or drink from dawn until dusk. While the frequency of eating normally decreases during Ramadan, whether there is a reduction in quantity and total energy intake remains questionable because dietary practices during Ramadan are influenced by local culture, economic status and individual dietary behavior. Therefore, although rationally, Ramadan should provide a supportive environment for diet control, as food is not easily available during the day (because most food outlets are closed during the daytime during Ramadan in many Muslim countries), on the contrary, Ramadan has become known as a month of feasting in many Muslim societies. Several studies have shown that there are significant increases in protein and carbohydrate intake during Ramadan, and in fact, certain studies have reported significant weight gain during Ramadan.[2-7] In this study, an attempt was made to take advantage of the environment of Ramadan to control the quantity of food intake in a group of overweight and obese Malay Muslim women because there is a high probability that the quantity of food consumed by those who are overweight or obese is more than the recommended quantity. The choice of gender in this study was based on the sociodemographic analysis of the Third Malaysia National Health and Morbidity Survey (NHMS III) in 2006, which reported that the prevalence of obesity was significantly higher among women.[8] The choice of ethnic group was based on another national study, which observed that the probability of Malay Muslim women becoming obese was 3.63 times higher than in the reference group (that is, Chinese Buddhist women).[9] In the present study, the 2010 Malaysian Food Guideline (MFG) was used to increase respondents' knowledge, and a simple food diary was used to increase their skill in estimating their quantity of food intake. The objectives of this study were to determine the respondents' pre-Ramadan food consumption and then to observe their dietary changes during Ramadan with the intervention. This study period also provided a good opportunity to study body mass index (BMI), blood pressure (BP), fasting blood lipid profile (that is, total cholesterol (TC), high density lipoprotein-cholesterol [HDL]-C, low density lipoprotein-cholesterol [LDL-C], and triglyceride [TG]), and fasting blood sugar (FBS) changes during Ramadan. Although the study had certain limitations, the findings of this single-group intervention study hopefully provide useful information for the development of health programs to control excess weight gain among Muslims in Malaysia, and specifically programs taking advantage of the environment of Ramadan.

Methods.

Study setting and population. This study was conducted during the months of Ramadan 2011. Two public offices in Seremban (the capital of Negeri Sembilan, one of the 14 states in Malaysia) agreed to participate in the study. Malay Muslim female employees of any age and employment position, and with a BMI ≥25 kg/m^2 were invited to participate. The exclusion criteria included pregnancy, medical conditions that prevented fasting, treatment with cholesterol-lowering drugs, and use of a commercial replacement diet for weight reduction.

Intervention. The 2010 MFG is a dietary guideline developed by Malaysia's Ministry of Health that recommends a specific quantity for each food group (mainly carbohydrates, fruits and vegetables, protein and milk and dairy products) to Malaysians. The recommendations vary according to the person's gender, age group and level of physical activity. In this guideline, the food quantity guide is explained to the public using examples from local menus. Making use of common measurements such as cups, pieces and scoops, the quantity of food is clarified using estimates of one-unit servings. The recommendations are then explained as allowable numbers of servings per day according to the food groups. The MFG has been made known to the public via health campaigns, including pamphlet dissemination. In the present study, each respondent was given a copy of the MFG pamphlet. Based on the pamphlet, the respondents were briefed on how to monitor and estimate their daily consumption of the 4 food groups listed (carbohydrates, fruits and vegetables, protein and milk and dairy products). They were also briefed regarding the serving recommendations for each food group appropriate for them (women who were not physically active). The respondents were also given a 7-day food diary to record their daily food intake. The

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food diary included tables that allowed them to note down the number of servings consumed during each meal and the total at the end of each day.

Data collection. The 7-day dietary record (habitual food intake) and BMI, BP, fasting blood lipid profile, and FBS data were collected just before Ramadan as a baseline. During Ramadan, the 7-day dietary record was collected in the third week, whereas the BMI, BP, blood lipid profile, and FBS data were collected in the fourth week of Ramadan. The BMI was calculated using the measurements for body weight (TANITA weighing scale) and height (SECA body meter). The BP was measured using an OMRON automatic pressure monitor. The BP readings were measured thrice during rest and were then averaged. All measuring equipment was calibrated prior to data collection. Blood samples were drawn by a qualified phlebotomist. The fasting blood lipid profile and FBS were analyzed using a 5 ml venous blood sample that was collected after 8 hours of fasting. Blood plasma was analyzed at a university pathology laboratory using a standard biochemical analyzer (Roche Hitachi C311, Mannheim,Germany).

Ethical approval. This study was approved by the institutional Research and Ethics Committee. This study has observed the principles in the Helsinki Declaration. Information on the scope, benefit and potential risk was explained to the respondents, and written consent was obtained from each of them.

Data analysis. Data were entered, cleaned, and analyzed using IBM SPSS software version 20 (IBM Corp., Armonk, NY, USA). The significance level was set at $p<0.05$, and confidence interval was 95%. The records from the 7-day food diary were summed-up, and averaged to determine the number of servings per day according to the food group. The mean number of servings was then compared with the MFG recommendations for women who are not physically active. The paired t test was used to compare between the baseline measurements (food intake, BMI, BP, fasting blood lipid profile, and FBS) and the measurements during Ramadan. This study opted to use the intention-to-treat method to handle missing respondents during follow-up. When using this method, missing values during follow-up were replaced with baseline values, assuming that there was no change. This method gives an unbiased estimate of a treatment effect.[10] Therefore, all respondents who were recruited at baseline were analyzed.

Results. ***Sociodemographic characteristics.*** A total of 84 women who met the requirements were recruited for the study. Their mean age was 39.8 ± 10.3 years, and the mean number of children per woman was 2.7 ± 1.9. Most of the women were married (85.7%), and had finished high school (67.9%), with the rest being either diploma, or degree holders. With regard to employment position, 78.6% of respondents were clerks, and 12.4% were officers. Their mean household income was Malaysian Ringgit 3368.9 ± 2212.3.

Response rate. Only 70 respondents (83.3%) participated in the follow-up session during Ramadan. However, because this study opted to use the intention-to-treat method, the number of respondents analyzed was still the original 84.

Food quantity and percentages. The MFG recommendations for women who are not physically active are 4 servings of carbohydrates (food group 1), 5 servings of vegetables and fruits (food group 2), 2 servings of protein (food group 3), and 1 serving of milk and dairy products (food group 4). Compared with the MFG recommendations, the pre-Ramadan intake quantities of carbohydrates (3.14 servings per day [78.5%]) and 'vegetables and fruits' were lower (2.22 servings per day [44.4%]) were lower, but the intake quantities of protein (2.15 servings per day [107.5%]), and 'milk and dairy products' (1.33 servings per day [133%]) were higher. During Ramadan, the intake quantity of carbohydrates was further lowered (2.64 servings per day [66%]), whereas the intake quantity of 'vegetables and fruits' (2.27 servings per day [45.4%]) slightly increased, but both were still lower than the recommended intake quantities. Despite already being higher than the MFG recommendation at baseline, the intake quantity of protein further increased during Ramadan, to 2.27 servings per day (113.5%). The intake quantity of 'milk and dairy products' slightly decreased during Ramadan to 1.29 servings per day (13%), but it was still higher than the MFG-recommended quantity. **Table 1** shows that there were no significant changes in mean food consumption during Ramadan, except for a significant decrease in the quantity of carbohydrate intake.

The BMI, BP, fasting blood lipid profile, and FBS. **Table 1** also shows that the mean BMI was significantly lower during Ramadan. The mean systolic and diastolic pressures were also reduced during Ramadan, but these reductions were not statistically significant. Except for TC, all of the other blood lipid profiles (such as, HDL-C, LDL-C, and TG), as well as the FBS levels were significantly lower during Ramadan. The TC/HDL-C ratio, however, showed a significant increase during Ramadan.

Table 1 - The changes of food intake, body mass index (BMI), blood pressure (BP), fasting lipid profile, and fasting blood sugar (FBS) levels among the respondents during Ramadan (N=84).

Variable	Baseline Mean ± SD	Ramadan Mean ± SD	Paired t-test	95% confidence interval	*P*-value
Food group, servings/day					
1. Carbohydrate	3.14 ± 1.09	2.64 ± 0.84	4.20	0.26245, 0.73500	0.000*
2. Vegetables and fruits	2.22 ± 1.12	2.27 ± 1.02	0.45	-0.26415, 0.16721	0.656
3. Protein	2.15 ± 0.83	2.27 ± 1.09	2.57	-0.34781, 0.10971	0.304
4. Milk and dairy products	1.33 ± 0.91	1.29 ± 0.97	0.36	-0.15943, 0.23086	0.717
BMI and BP changes					
Body mass index (kg/m^2)	31.14 ± 4.26	30.47 ± 4.26	9.19	0.52107, 0.80887	0.000*
Systolic BP (mm Hg)	124.51 ± 18.14	123.27 ± 16.14	1.23	-0.76299, 3.23918	0.222
Diastolic BP (mm Hg)	76.37 ± 10.08	76.37 ± 9.31	0.15	-1.49982, 1.73792	0.884
Blood biochemical changes					
TC (mmol/l)	4.68 ± 1.16	4.62 ± 0.96	4.01	-0.15326, 0.28564	0.550
HDL-C (mmol/l)	1.27 ± 0.36	0.89 ± 0.31	0.60	0.29409, 0.45329	0.000*
LDL-C (mmol/l)	2.60 ± 0.75	2.35 ± 0.61	9.34	0.13005, 0.37471	0.000*
Triglyceride (mmol/l)	0.99 ± 0.40	0.89 ± 0.31	4.10	0.02906, 0.15975	0.005*
FBS (mmol/l)	4.42 ± 0.87	4.24 ± 0.79	2.87	0.02801, 0.34842	0.022*
TC/HDL-C	3.87 ± 1.06	5.61 ± 1.80	2.34	-2.02586, -1.44814	0.000*

*significant at $p<0.05$. TC - total cholesterol, HDL-C - high density lipoprotein-cholesterol, LDL-C - low density lipoprotein-cholesterol

Discussion. The quantity of food consumed by overweight and obese people was expected to be greater than the recommended quantity, especially for the main energy-contributing food groups, such as, carbohydrates and protein. In this study, at baseline, compared with the MFG recommendations, the quantity of carbohydrate consumption was lower, but the quantity of protein consumption was higher. Therefore, the excess energy intake among the respondents could have been from protein. This high protein consumption among the respondents could have been due to the trend of increasing protein intake among Malaysians, and especially among urban dwellers.[11] Previous studies observing dietary changes during Ramadan, without any intervention, have shown that protein consumption increased.[2-5]

A similar finding was observed in the present intervention study. Despite the respondents' knowledge that their protein consumption was already higher than the recommended quantity pre-Ramadan, there was a further increase during Ramadan. This finding could indicate that the respondents were unsuccessful in controlling their protein consumption during Ramadan, despite receiving relevant information about the MFG. This hypothesis supports the general perception that in many societies, the month of Ramadan is a month of feasting. The selection of food during Ramadan usually consists of a greater amount of protein than in other months. At baseline, the consumption of 'milk and dairy products' among the respondents was also higher than the MFG recommendation. This finding could be related to the fact that the respondents were all female, and thus, they could have been more aware of osteoporosis prevention by drinking milk.[11] However, during Ramadan, the quantity of 'milk and dairy products' consumed was slightly reduced in this study, and this observation is consistent with a study in the United Arab Emirates that showed a significant reduction during Ramadan. The difference in the extent of consumption of 'milk and dairy products' during Ramadan could be due to different dietary habits in different countries, and it could also be influenced by the socioeconomic status of the country or the studied population.[12]

Vegetable and fruit intake was very low among the respondents. Studies have reported a similar observation of low consumption of vegetables and fruits among Malaysians that did not meet the World Health Organization's recommendation.[13,14] In the present study, even though the respondents were aware that their vegetable and fruit consumption was low, the task of increasing vegetable and fruit consumption during Ramadan was not accomplished. As a result, vegetable and fruit consumption only slightly increased during Ramadan. One of the possible reasons for this obstacle was the distance of this study population from the primary sources of vegetables and fruits. Because the study area is in an urban area, it could be far from the primary sources, and thus, vegetables and fruits could be less available or could be costly.

Studies have shown that the consumption of vegetables and fruits is influenced by socioeconomic status; consumption is greater among those with higher education and thus a higher income.[15,16] There are also other important factors influencing vegetable and fruit consumption, such as cultural factors, which were not studied here. The consumption of vegetables and fruits should be insistently encouraged, even during Ramadan, especially among overweight and obese people. Although increasing vegetable and fruit consumption alone does not necessarily reduce weight, studies have shown a positive correlation between these dietary practices and both weight loss and weight loss sustainability.[17,18]

At baseline, the quantity of carbohydrates consumed by the respondents was also lower than the MFG recommendation. Although it was not intended during the intervention, there was a further significant reduction in carbohydrate consumption during Ramadan. Changes in the quantity of food consumption, and especially carbohydrate and protein quantities, can predict changes in energy intake and body weight. In this study, the patterns of reduced carbohydrate intake and reduced BMI were similar (such as, both reductions were significant). The reduction in carbohydrate consumption could have corrected the energy imbalance in this group of overweight and obese respondents, thus causing reduced body weight. Although the study respondents were not encouraged to practice any specific diet restriction (such as a low-carbohydrate diet), the results showed that a reduction in the quantity of carbohydrate intake happened naturally during Ramadan. Although the prescription of a low-carbohydrate diet to reduce weight is still controversial, studies have examined this relationship and have shown that a 'low-carbohydrate' diet did result in successful weight loss.[19,20] This weight loss during Ramadan could be used to advantage. Furthermore, studies have shown that a substantial amount of initial weight loss (such as weight loss during Ramadan) contributes positively to further weight loss, weight loss maintenance and control of weight regain.[21] Thus, significant weight loss during Ramadan among overweight and obese Muslims could be one of the main positive predictors of their further weight management. In addition to a significant decrease in BMI, this study also showed reductions in systolic and diastolic BPs, but these reductions were not statistically significant. The reduction in BP could be related to the reduction in BMI, as many studies have established a positive association between body weight and BP.[22,23]

Many studies have examined changes in lipid profiles during Ramadan. Except for the change in the TG level, the changes in the other lipid levels (TC, HDL-C and LDL-C) during Ramadan showed mixed results and thus were not conclusive.[3,7,12,24-27] The consistent findings of a reduced TG level during Ramadan could indicate an inherent metabolic change due to fasting, rather than due to dietary changes. In the current study, all blood lipid levels decreased during Ramadan. As this study did not study fat or cholesterol intake, no possible explanation could be offered, except that these reductions may have been due to the overall reduction in the quantity of food intake. However, the main focus in the lipid analysis was the TC/HDL-C ratio changes during Ramadan. The TC/HDL-C ratio is a health risk indicator. Increasing the TC/HDL-C ratio indicates increasing risk and vice versa. In this study, the TC/HDL-C ratio increased significantly during Ramadan. This is because the reduction in HDL-C was greater than the reduction in TC during Ramadan. The HDL-C reduction could have been due to the decreased level of physical activity among the respondents during Ramadan. Studies have shown that the level of HDL-C is positively influenced by the level of physical activity.[28,29] Hence, Muslims should be encouraged to maintain their physical activity during Ramadan. The FBS levels observed in this study also showed a significant decrease during Ramadan, despite the sweetness of many Ramadan delicacies. The decreased FBS in this study could have been related to the reduction in carbohydrate consumption and could also have been due to the self-restraint of the respondents, based on their knowledge regarding the MFG, which consists of types of food to avoid, including sweet delicacies.

Limitations and strengths. The main limitation of this study was the absence of a control group. Nevertheless, this study has provided pertinent insights for future studies to obtain more conclusive results on the effectiveness of knowledge-based intervention grounded in the MFG to reduce the weight of overweight and obese Muslims in Malaysia. The other limitations were the use of the intention-to-treat method in handling lost data, which could threaten the internal validity of the study. The method for reporting the quantity of food intake was based on self-report, and the measurement unit was the number of servings per day. These methods were chosen because they are simple and thus could reduce the attrition rate; however, these methods could be biased and less accurate. The strengths of this study were that it focused on a group known to have a high prevalence of overweight and obese individuals (Malay women) and that it used the national food guideline (MFG), which is presumed to be easily available to

the public. This intervention also made the most of the environment of Ramadan. This approach could be regarded as culture or religion specific and thus could be more appropriate and effective.[30]

In conclusion, although the feasting effect during Ramadan was still detected, despite the intervention (especially in the consumption of protein), the Ramadan fast that was guided by knowledge of the MFG showed many positive dietary, anthropometric and blood biochemical effects. Therefore, increasing knowledge of the MFG before Ramadan could prove to be a good intervention strategy to help the overweight and obese Muslims in Malaysia to achieve a substantial amount of initial weight loss.

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