

## Dietetic Practices in the Management of Childhood Obesity in Malaysia

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### ABSTRACT

**Introduction:** Dietitians play an essential role in the management of childhood obesity and consistency in dietetic practices is required to ensure the effectiveness of treatment. This study assessed dietitians' current practices in the management of childhood obesity, compared the practices with nutrition practice guidelines used by dietitians in other countries and identified practice components for the development of nutrition practice guidelines for the management of childhood obesity in Malaysia. **Methods:** A cross-sectional study was conducted among 40 dietitians in 16 Ministry of Health hospitals and three teaching hospitals. Information on current dietetic practices in the management of childhood obesity was obtained through a mailed survey questionnaire. The practices included nutritional assessment, determination of energy requirement, dietary prescription and physical activity modification. Emails were sent to 31 dietetic associations in other countries to obtain information on practice guidelines used by dietitians. **Results:** Frequently used dietary intervention and physical activity modification approaches were high fibre diet (65%), low fat diet (40%), reduction of sedentary pursuits and screen times (67.5%) and an increase in duration of current physical activities (60%). In comparison to other dietetic practice guidelines, the current dietetic practices in Malaysia do not usually include waist circumference, biochemical and blood pressure data. However, similar to other guidelines, the current dietetic practices included low dietary fat, high fibre diet, decreased sedentary activity and increased physical activity level. **Conclusions:** The dietetic practices in the management of childhood obesity in Malaysia are diverse. A comprehensive nutrition practice guideline for management of childhood obesity is urgently needed for standardisation of dietetic practices in Malaysia.

**Keywords:** Children, dietary intervention, dietetic practices, obesity, physical activity

## INTRODUCTION

Childhood obesity is a worldwide problem and the prevalence is increasing, particularly in developing countries undergoing nutrition transition. The prevalence of childhood overweight and obesity was estimated at 11.7% in developed countries and 6.1% in developing countries. However, the relative percentage change was higher in developing countries (an increase of 65% between 1990 and 2010) than in developed countries (an increase of 48% between 1990 and 2010) (de Onis, Blossner & Borghi, 2010). Overall, the worldwide prevalence of childhood overweight and obesity has increased from 4.2% in 1990 to 6.7% in 2010 and is expected to reach a prevalence of 9.1% in 2020. Therefore, it is estimated that in 2020, 60 million children will be overweight and obese (de Onis *et al.*, 2010).

In Asia, the prevalence of childhood obesity is also on the rise. According to the National Surveys on the Constitution and Health among school children in China, the prevalence of obesity among children aged 7 – 18 years old increased 28 times from 1985 to 2000 (Ji, Sun & Chen, 2004). In Thailand, the prevalence of obesity among children aged 2-5 years and 6-12 years old increased from 5.8% in 1997 to about 7.9% and 6.7% in 2000 (Aekplakorn & Mo-Suwan, 2009). Malaysia is no exception to the rising prevalence of childhood obesity. The Malaysian Third National Health and Morbidity Survey reported that the prevalence of at risk of overweight and overweight among children below five years was 3.6% and 5.3%, respectively (Khor *et al.*, 2009). Whereas, recent data from the Nutrition Survey of Malaysian Children (SEANUTS Malaysia) showed that the prevalence of overweight and obesity for children 6 months to 12 years old were 9.8 % and 1.8 %, respectively (Poh *et al.*, 2013).

The treatment of childhood obesity is crucial and it needs a multidisciplinary health team that consists of pediatricians, dietitians, nurses and physiotherapists. In addition, family members' involvement as well as culturally appropriate intervention are also important for the success of the childhood obesity management program (Skelton, DeMattia & Flores, 2008). Dietitians play an essential role in the management of childhood obesity in that they provide comprehensive dietary management (Grace, 2011). A nutrition practice guideline can assist both dietitians and patients to make decisions on appropriate treatment and management of specific clinical conditions (Lohr, 1990). It is also an important tool to standardise and evaluate the treatment given by dietitians to improve the condition or disease outcomes (Nisak *et al.* 2013). Availability of specific obesity guidelines that incorporate important aspects of obesity management can contribute to consistent and effective treatment (Almajwal, Williams & Batterham, 2009).

At present, a nutrition practice guideline for the management of childhood obesity that can be utilised by dietitians in the clinical setting of Malaysia is not available. To develop a clinical practice guideline, current dietetic practices related to childhood obesity management in Malaysia need to be assessed. In addition, information on available nutrition practice guidelines in other settings is required for comparison. Therefore, this study aimed to assess current practices in the management of childhood obesity that includes nutritional assessment, determination of energy requirement, dietary prescription and physical activity modification. It also compared the current practices with practice guidelines used by dietitians in other countries to identify practice components for the development of nutrition practice guidelines for the management of childhood obesity in Malaysia.

## METHODS

### Subjects

The survey was conducted among 57 dietitians working at 16 Ministry of Health (MOH) hospitals and three teaching university hospitals from July until November 2011. The hospitals were selected based on two criteria: (1) state and teaching hospitals that provide dietetic service for the management of childhood obesity; and (2) in each hospital, at least three dietitians are actively involved in the management of childhood obesity. The dietitians were recruited into the study if they managed childhood obesity cases at the time of the survey and had at least one year experience in the management of childhood obesity. Ethical approval was obtained from the Medical Research Ethics Committee of Universiti Putra Malaysia, Medical Review and Ethics Committee of Ministry of Health Malaysia and all teaching hospitals. Written informed consent was also obtained from participating dietitians.

### Questionnaire

A set of a self-administered questionnaires was developed to elicit information on the dietitians' current management of childhood obesity. The dietitians were requested to report practices related to nutritional status assessment, determination of energy requirement, dietary prescription and physical activity modification. The nutritional status assessment section consisted of anthropometry (4 items), biochemical (3 items), clinical (1 item) and diet history (4 items). Five items were included for determination of energy requirement. Dietary prescription had nine items that focused on types of diet the dietitians used in managing obese children. The types of diet were categorised into two sub-sections, namely, restricted diet (3 items) and alteration of specific macro-nutrient diet (6

items). There were nine items in the physical activity modification section that covered specific (3 items) and none specific modifications (3 items). Each item was ranked on a Likert scale (most of the time = 4, often = 3, sometimes = 2, rarely = 1 and never = 0) with a higher score indicating that the practice item was the most frequently used by dietitians. In every section, open-ended questions were provided to allow subjects to provide more information related to the respective section. The questionnaire was pretested to ensure clarity, comprehensiveness and appropriateness of the items.

Other information obtained included dietitian's personal information and dietetic service in the hospital. Dietitian's personal information consisted of socio-demographic and academic qualifications. Dietetic service comprised the number of years in service, the number of years in childhood obesity management, the number of obese children seen by dietitians in the past six months, time allocation for new appointments as well as follow up visits, the number of additional appointments and availability of nutrition practice guidelines for the management of childhood obesity.

The questionnaire was mailed to 57 dietitians together with a cover letter, study information sheet and consent form. To increase response rate, a stamped envelope with a return address was provided to the subjects. The head of dietitians from the respective hospitals were contacted to inform them about the mailed questionnaires. A total of 40 questionnaires were received from dietitians, yielding a response rate of 70.2%.

### Compilation of guidelines on childhood obesity management

A list of dietetic associations was obtained from the website of the International Confederation of Dietetic Association (ICDA) at <http://www.internationaldietetics.org/NDAs.aspx>. There were 42 dietetic

associations registered with ICDA. However, only 31 dietetic associations had contact email addresses. An email was sent to these dietetic associations and it consisted of two questions; (1) Does the dietetic association have a standard or practice guideline in managing childhood obesity? (2) Is the standard or practice guideline in English?

Twelve dietetic associations responded to the email, but only seven had guidelines in managing childhood obesity. Of the seven dietetic associations, only three fulfilled the inclusion criteria: (1) the guideline is approved by the dietetic association and used by dietitians in their daily practices; (2) the guideline is in English or has been translated to English; (3) the guideline covers nutritional status assessment, determination of energy requirement, dietary prescription and physical activity modification. The three guidelines were Evidence-based Pediatric Weight Management Nutrition Practice Guideline 2009, Clinical Guidelines for Weight Management in New Zealand Children and Young People 2009 and Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity in Adults and Children 2006 (Academy of Nutrition & Dietetics, 2013; Jull *et al.* 2011; Lau *et al.* 2007). The current dietetic practices in Malaysia were then compared to the three guidelines in terms of nutritional status assessment, determination of energy requirement, dietary prescription and physical activity modification. Practice items that scored 50% and more for 'most of the time' and 'often' used in daily practices were considered to meet the practice guideline.

#### Statistical analysis

Data were analysed using SPSS version 19 (SPSS Inc., 2010, Chicago, Illinois). Data on characteristics of the dietitians and hospitals as well as scores for each section are presented descriptively as mean, standard deviation, frequency and range.

## RESULTS

Most of the dietitians in the study were females (85%) (Table 1). About 42.5% of the dietitians had more than four years of experience in childhood obesity management. The number of obese children counselled in the past six months ranged from 2 - 72 children. On average, the amount of time allocated for new appointments and follow-up visit were  $42.75 \pm 7.51$  minutes and  $26.63 \pm 6.83$  minutes, respectively. None of the dietitians reported of their hospital having a nutrition practice guideline for the management of childhood obesity. However, two dietitians indicated that they follow the Evidence-based Pediatric Weight Management Nutrition Practice Guideline 2009 by the Academy of Nutrition & Dietetics (2013).

Table 2 shows nutritional assessment of obese children as reported by the dietitians. About 45-55% of dietitians mostly used CDC growth chart Body Mass Index (BMI)-for-age and WHO growth chart BMI-for-age (CDC, 2000; de Onis *et al.*, 2007). The majority of the dietitians never used waist circumference (57.5%), skinfold thickness (85%) and Bioelectric Impedance Assay (BIA) (90%) in their practice. Only, 27.5% of the dietitians assessed blood glucose and blood pressure of obese children most of the time in current practices. For diet history, all dietitians assessed dietary intake (100%), while 70% and 57.5% assessed breast feeding/ infant formula and complementary feeding information most of the time, respectively to get complete information on diet history.

Table 3 shows dietary management and physical activity modification approaches in current dietetic practices. Most of the time, the dietitians used FAO/WHO/UNU (1985) (65%) followed by RNI Malaysia (NCCFN, 2005) (47.5%) and Quick Method by Shils & Goodhart (1980) (35%) to determine energy requirement of obese children. Most frequently used dietary prescriptions were high fibre diet (65%) and low fat diet (40%). The dietitians reported that advising a

**Table 1.** Socio-demographic characteristics and professional practices of dietitians

Variable	n (%)	Mean $\pm$ S.D
Age (year)		29.97 $\pm$ 3.53
Gender		
Males	6 (15.0)	
Females	34 (85.0)	
Higher degree awarded		
Bachelor	39 (97.5)	
Master	1(2.5)	
Years in service		6.12 $\pm$ 3.63
Years of experience in childhood obesity		4.01 $\pm$ 3.47
Management		
Less than 4 years	23 (57.5)	
More than 4 years	17 (42.5)	
Obese children counselled in the past six months		
1 - 3 years old	15 (17.2)	
4 - 6 years old	20 (23.0)	
7 - 9 years old	25 (28.7)	
10 - 12 years	27 (31.0)	
Time allocated for new appointments (minutes)		42.75 $\pm$ 7.50
Time allocation for follow-up/ second visit (minutes)		26.63 $\pm$ 6.83
Frequency of follow-up appointments		
One a month	8 (20.0)	
Once every two months	11 (27.5)	
Once every three months	16 (42.5)	
Once every > three months	10 (10.0)	

reduction in sedentary pursuits and “screen time” (67.5%), increasing duration of activities already performed (60%) and prescribing more fun and recreational activities for children (50%) were the most frequently used physical activity modification. About 60% of the dietitians rarely or never advised children to take up muscle and bone strengthening activities.

The comparison of current dietetic practices in Malaysia to the practice guidelines used by dietitians in other countries is presented in Table 4. The current dietetic practices in Malaysia were consistent with other guidelines in the use of BMI to assess child obesity. However, all the guidelines used CDC growth reference for BMI-for-age as compared to WHO growth standard for BMI-for-age, which is currently used by dietitians in Malaysia. Childhood obesity was determined based on CDC

growth reference for BMI-for-age and WHO growth standard for BMI-for-age with the cut-off more than or equal to 95<sup>th</sup> percentiles (CDC, 2000; de Onis *et al.*, 2007). In contrast to other guidelines, current dietetic practices did not measure waist circumference. All the guidelines determined biochemical parameters but in current dietetic practices, only a small percentage (25 % - 27.5%) of dietitians assessed lipid and glucose parameters of obese children. For dietary assessment, all the guidelines and current dietetic practices included diet history, current dietary intake and receptivity to change. Information on breastfeeding, use of infant formula and complementary food were obtained in current practices but not in other guidelines.

A balanced macronutrients diet, low dietary fat and high fibre diet were included in all guidelines and current dietetic

**Table 2.** Dietitians' current practices related to nutritional assessment of childhood obesity

Assessment tools	Response (%)					Score Mean ± S.D
	Most of the time	Often	Sometimes	Rarely	Never	
<b>Anthropometry</b>						
BMI						
CDC Growth Chart, 2000	55.0	12.5	12.5	5.0	15.0	2.88 ± 1.51
WHO Growth Chart, 2007	45.0	20.0	12.5	10.0	12.5	2.75 ± 1.45
Waist circumference	0	0	17.5	25.0	57.5	0.60 ± 0.78
Skinfold thickness	0	0	0	15.0	85.0	0.15 ± 0.36
Bioelectric Impedance Assay	0	0	2.5	7.5	90.0	0.13 ± 0.40
<b>Biochemical</b>						
Blood glucose (RBS/FBS)	27.5	17.5	25.0	20.0	10.0	2.33 ± 1.35
Lipid profile (TC/HDL/LDL)	25.0	17.5	25.0	12.5	20.0	2.15 ± 1.46
Liver profile	25.0	15.0	17.5	17.5	25.0	1.98 ± 1.54
<b>Clinical</b>						
Blood pressure	27.5	17.5	27.5	15.0	12.5	2.33 ± 1.37
<b>Diet history</b>						
Assess dietary intake	100	0	0	0	0	4.00 ± 0.00
Assess information on breast feeding/infant formula	70.0	20.0	10.0	0	0	3.60 ± 0.67
Assess information on when complementary food was introduced	57.5	25.0	17.5	0	0	3.40 ± 0.78

Higher score indicates that the practice item was the most frequently used by dietitians. The score was calculated based on the Likert scale (Most of time = 4; Often = 3; Sometimes = 2; rarely = 1; never = 0)

BMI - Body Mass Index; CDC- Centers for Disease Control and Prevention; FB - fasting blood sugar; HDL- high-density lipoprotein; LDL - low-density lipoprotein; RBS - random blood sugar; RNI - Recommended Nutrient Intakes ;TC- total cholesterol; WHO - World Health Organization

**Table 3.** Dietitians' current practices related to dietary management and physical activity modification of obese children

Management	Most of the time	Response (%)			Score*	Mean ± S.D			
		Sometimes	Rarely	Never					
<b>Dietary management</b>									
<b>Determination of energy requirement</b>									
FAO/ WHO/ UNU	65.0	17.5	7.5	7.5	2.5	3.35 ± 1.08			
RNI Malaysian	47.5	10.0	20.0	20.0	2.5	2.80 ± 1.30			
Quick Method	35.0	15.0	2.5	20.0	27.5	2.10 ± 1.71			
Catch-up Growth	30.0	10.0	12.5	5.0	42.5	1.80 ± 1.76			
Harris-Benedict	2.5	7.5	15.0	27.5	47.5	0.90 ± 1.08			
Seashore	5.0	2.5	10.0	20.0	62.5	0.68 ± 1.10			
Schofield Equation	0	0	12.5	22.5	65.0	0.48 ± 0.72			
<b>Dietary prescription</b>									
High fibre diet	65.0	27.5	2.5	2.5	2.5	3.50 ± 0.88			
Low fat diet	40.0	32.5	7.5	15.0	5.0	2.88 ± 1.24			
Low energy diet	25.0	20.0	30.0	5.0	20.0	2.25 ± 1.43			
Traffic light diet	25.0	20.0	10.0	17.5	27.5	1.98 ± 1.59			
High protein diet	10.0	10.0	20.0	25.0	35.0	1.35 ± 1.33			
Low-glycemic-load diet	7.5	10.0	12.5	32.5	37.5	1.18 ± 1.26			
Low-glycemic- index diet	5.0	7.5	15.0	20.0	52.5	0.93 ± 1.21			
Very low carbohydrate diet	5.0	0	15.0	20.0	60.0	0.70 ± 1.07			
Very low calorie diet/ protein sparing modified fat	2.5	2.5	15.0	15.0	65.0	0.63 ± 1.00			
<b>Physical activity modification</b>									
Encourage children to reduce sedentary pursuits and "screen time"	67.5	25.0	7.5	0	0	3.60 ± 0.63			
Request children to increase duration of activities already performed	60.0	22.5	17.5	0	0	3.43 ± 0.78			
Prescribe more fun and recreational activities for children	50.0	25.0	22.5	2.5	0	3.23 ± 0.89			
Request children to do at least 60 minutes of moderate-intensity to vigorous aerobic physical activity throughout the day	25.0	10.0	35.0	17.5	12.5	2.18 ± 1.34			
Prescribe less than two hours (out of kindergarten / school time) of television, computer or game consoles	17.5	22.5	25.0	22.5	12.5	2.10 ± 1.30			
Encourage children to include muscle strengthening and bone-strengthening activities at least three days of the week	12.5	10.0	17.5	30.0	30.0	1.45 ± 1.36			

Higher score indicates that the practice item was the most frequently used by dietitian. The score was calculated based on the Likert scale ( Most of time = 4; Often = 3; Sometimes = 2; rarely = 1; never = 0); Catch-up Growth (Peterson, 1984); FAO/ WHO/ UNU (1985); Harris &Benedict (1918); Quick Method (Shils & Goodhart, 1980) ; RNI Malaysian (NCCFN, 2005); Schofield Equation (1985)

**Table 4.** Comparison of current dietetic practices in Malaysia to nutrition practice guidelines used by dietitians in other countries.

<i>Components</i>	<i>American Dietetic Association</i>	<i>Dietitians of Canada</i>	<i>Dietitians New Zealand</i>	<i>Current Practice in Malaysia*</i>
Age group	2 - 18 years	2- 18 years	Aged up to 14 years	
Assessment				
Anthropometry				
BMI (BMI for age)	√	√	√	√
CDC Growth chart	√	√	√	√
WHO Growth Chart				
Definition of obesity	BMI > 95th percentile (CDC Chart)	≥95 <sup>th</sup> percentile = obese (Cut off based on CDC, while terminology based on IOTF)	BMI > 95 <sup>th</sup> percentile (CDC chart)	
Waist circumference	√	√	√	
Biochemical data				
Glucose and lipid profile	√	√	√	
Clinical				
Medical background	√		√	√
Blood pressure	√		√	
Diet				
Comprehensive diet history, current dietary intake and receptivity to change	√	√	√	√
Breastfeeding/ infant formula use				√
Assessment on introduction of complementary food				√
Food checklist	√		√	
Child and family eating behaviours	√		√	
Dietary management				
Goal (weight reduction and weight maintenance)	√		√	
Determination of energy requirement				
Specific formula				
FAO/WHO/UNU 1985				√

Continued on next page

**Table 4.** From previous page

RNI Malaysia (2005)					✓
Minimum calories/ Low energy diet	Minimum calories: 900-1200 kcal				
Diet prescription					
A balanced macronutrients diet	✓	✓		✓	✓
Altered macronutrient diets					
Low glycemic load diet	✓				
Low glycemic diet		✓			
Protein sparing modified fast	✓	✓			
Low dietary fat	✓	✓		✓	✓
Very low carbohydrates dietary approaches	✓				
High fibre diet (increase intake of fruits and vegetables	✓	✓		✓	✓
Traffic Light Diet	✓	✓			
Eating patterns	✓				
Specific food					
Calcium and dairy products	✓	✓			
Fruits juice intake	✓				
Calorically sweetened beverages	✓				
Non-nutritive sweeteners	✓				
Physical activity modification					
Decreasing sedentary behaviours	✓		✓		
Increasing physical activity	✓		✓		
Specific duration of physical activity (e.g. less than 2-hours for screen time, moderate-intensity or vigorous physical activity To at least 60 minutes per day)				"	

\*Item is ranked '✓' if ≥ 50% of dietitians reported using the practice as 'most of the time' or 'often'.

BMI - Body Mass Index; CDC- Centers for Disease Control and Prevention; FB - fasting blood sugar; HDL- high-density lipoprotein; LDL - low-density lipoprotein; RBS - random blood sugar; RNI - Recommended Nutrient Intakes ;TC- total cholesterol; WHO - World Health Organisation.

practices for dietary prescription. At least two of the guidelines included alteration of specific foods such as an increase in intake of calcium and dairy products, reduced intake of fruits juice and calorically sweetened beverages (Academy of Nutrition & Dietetics, 2013; Lau *et al.*, 2007). For physical activity, all guidelines and current dietetic practices in Malaysia incorporated strategies that decrease sedentary activity and increase physical (Academy of Nutrition & Dietetics, 2013; Jull *et al.*, 2011; Lau *et al.*, 2007). Only the Guidelines for Weight Management in New Zealand Children and Young People 2009 mentioned

specific duration of physical activity (Jull *et al.*, 2011). Table 5 shows the practice components to be included in the proposed nutrition practice guidelines on the management of childhood obesity in Malaysia. The components are assessment of nutritional status (anthropometry, biochemical data, clinical and diet), determination of energy requirement based on RNI Malaysia (NCCFN, 2005), dietary prescription (a balanced macronutrients diet, low dietary fat and high fibre diet) and physical activity modification (decreased sedentary behaviours and increased physical activity).

**Table 5.** Proposed practice components of Nutrition Practice Guideline for the management of childhood obesity in Malaysia.

<i>Components</i>
A) Nutritional status assessment
I. Anthropometry
BMI (BMI for age)
WHO Growth Chart
Waist circumference
II. Biochemical Data
Glucose: RBS/FBS
Lipid profile: TC, HDL, LDL
III. Clinical
Medical background
Blood pressure
VI. Diet
Diet history, current dietary intake and receptivity to change
Food checklist
Child and family eating behaviours
B) Determination of energy requirement
RNI Malaysia (2005)
C) Dietary prescription
A balanced macronutrients diet:
Carbohydrates (45% to 65%), protein (10% to 35%), fat (20% to 35%)
Low dietary fat
High fibre diet: increase intake of fruits and vegetables
D) Physical activity modification
Decrease sedentary behaviours
Increase physical activity

Notes: BMI - Body Mass Index; CDC - Centers for Disease Control and Prevention; FBS - fasting blood sugar; HDL - high-density lipoprotein; LDL - low-density lipoprotein; RBS - random blood sugar; RNI - Recommended Nutrient Intakes; TC- total cholesterol; WHO - World Health Organisation.

## DISCUSSION

Childhood obesity is associated with chronic disease risk factors such as high blood pressure, hyperlipidaemia and hyperinsulinaemia. Children who were overweight or obese at one year old had greater risk of being overweight or obese and having unhealthy levels of body fat and LDL cholesterol at ages 5-8, which are markers of cardiovascular disease risk (Lindberg, Adams & Prince, 2012). In Malaysia, the increasing trend of childhood obesity has contributed to the development of metabolic syndrome (MetS) in children and about 82.4% of obese children have at least one component of MetS (Wee *et al.*, 2011; Quah, Poh & Ismail, 2010). A comprehensive assessment of obese children is crucial to identify the risk at an early age to prevent them from getting chronic diseases later in life.

Assessment is important in the management of childhood obesity. The present study showed that waist circumference, biochemical profile (blood glucose and lipid profile) and blood pressure, which are indicators of MetS are included in the nutrition practice guidelines of USA, Canada and New Zealand for assessment of obese children. However, it was not commonly assessed by dietitians in Malaysia.

Waist circumference is a good predictor of other measures of adiposity, insulin resistance and risk of heart disease because it takes into account body fat distribution (Chen, 2010). In obese children, waist circumference is a good predictor of dyslipidemia risk and insulin resistance. Obese children with waist circumference at or above the 90<sup>th</sup> percentile are at higher risk of dyslipidemia and insulin resistance than obese children with a normal waist circumference (Bassali *et al.*, 2010). Despite its importance, waist circumference is not a routine assessment by dietitians in Malaysia. This could be due to waist circumference reference for Malaysian children not being

available until recently (Poh *et al.*, 2011). It is also possible that the measurement could lead to embarrassment to the children as they are required to remove or loosen clothing at the midriff (Garnett *et al.*, 2007).

In Malaysia, biochemical profile of obese children is not routinely determined although obese children have a higher risk of MetS (Quah *et al.*, 2010). Studies showed that an increase in BMI among obese children contributed to higher levels of glucose and TG and low HDL-C, which are indicators of MetS (Wee *et al.*, 2011). Another important measurement is blood pressure. As obese children are at risk of hypertension, blood pressure should be routinely assessed in obese children (Wee *et al.*, 2011). In Malaysia, waist circumference, biochemical profile and blood pressure are only evaluated in obese adults (Clinical Practice Guidelines on Management of Obesity, 2004). It is suggested that these measurements be carried out in obese children as well (Quah *et al.*, 2010).

Determination of energy requirement is an important aspect in dietary management. Currently, the majority of dietitians in Malaysia use either FAO/WHO/UNU (1985) or RNI Malaysia (NCCFN, 2005) to determine energy requirement for obese children. The basis of these two recommendations are almost similar as RNI Malaysia (NCCFN, 2005) adopted the FAO/WHO/UNU (2004), which uses similar basic principles as FAO/WHO/UNU (1985) for estimating energy requirements for children and adolescents. However, FAO/WHO/UNU (2004) energy recommendations are on average, 18% lower for boys and 20% lower for girls <7 years of age, and 12% lower for boys and 5% lower for girls 7-11 years of age as compared to FAO/WHO/UNU (1985) because of the new available data on total energy expenditure (TEE). The RNI Malaysia (NCCFN, 2005) also utilises similar basic principles, but uses TEE derived from local data. For pediatric obesity management, the technical sub-committees suggested the RNI

Malaysia (NCCFN, 2005) be used for prescribing therapeutic diets that are nutritionally adequate.

In contrast, the dietitians in USA prescribe calories ranging from 900 to 1200 kcal according to the age group, while dietitians in Canada provide a caloric reduction of 500-1000 kcal less than normal requirement to promote weight loss of 0.5 – 1 kg a week (Academy of Nutrition & Dietetics, 2013; Lau *et al.*, 2007). However, the guidelines stressed on the importance of a nutritionally balanced diet (carbohydrates: 45 – 65%, protein: 10% – 35% and fat: 20% - 35%) to reduce energy intake (IOM, 2002). The use of energy restriction in weight management of obese children is based on a multi-disciplinary approach for a pediatric weight management programme that includes diet, physical activity, nutrition counselling, participation of parent or caregiver and monitoring by a physician (Academy of Nutrition & Dietetics, 2013).

In terms of dietary prescription, the current dietetic practices in Malaysia is consistent with other guidelines in the use of a balanced macronutrients diet, low fat diet and high fibre diet. A balanced macronutrients diet consists of carbohydrate (45% to 65%), protein (10% to 35%), fat (20% to 35%) (IOM, 2002). Prescribing a low fat diet is important as food high in fat, particularly saturated fats, are high energy dense (Vernarelli *et al.*, 2011). A randomised clinical trial of low fat diet among obese children and adolescents showed that a reduction of fat intake from  $31.1 \pm 1.1\%$  to  $26.8 \pm 1.5\%$  over a three-month intervention period significantly decreased BMI z score and improved waist circumference and systolic blood pressure (Mirza *et al.*, 2013).

High fibre diet is essential in the management of obesity because low intake of dietary fibre, especially fruits and vegetables is associated with risk of obesity (Johnson *et al.*, 2008). In addition, increased intake of total dietary fibre and insoluble dietary fibre is associated with decreased visceral adipose tissue and several bio-

markers such as serum leptin, plasma C-reactive protein, and plasma fibrinogen. In contrast, reduced consumption of dietary fibre of more than 1-2 years could increase visceral adipose tissue in obese children (Davis *et al.*, 2009). Therefore, it has been suggested that low intake of high energy dense food, high intake of fruits and vegetables and low fat intake may be an effective strategy to treat childhood obesity (Vernarelli *et al.*, 2011). In Malaysia, fibre recommendation for children, regardless of age is 20-30g per day, which is similar to the fibre recommendation for adults. Whereas, in Canada and United States of America, children are recommended to consume between 19 and 38 g/d fibre or 14 g fibre/ 1000 kcal. For example, for age group 4 -8 years, fibre recommendation is 25 g dietary fibre per day, while for age group 9 – 13 years old, the recommendation is 26 – 31 g per day (IOM, 2002).

Physical activity modification is crucial to the management of childhood obesity. Decreased sedentary activity and increased physical activity are prescribed for obese children in USA, Canada and New Zealand (Academy of Nutrition & Dietetics, 2013; Jull *et al.*, 2011; Lau *et al.*, 2007). Sedentary activity is defined as activities with energy expenditure at a level of 1.0-1.5 metabolic equivalent units (METs) (Pate, O'Neill & Lobelo, 2008). Sedentary activities include lying down, screen time such as watching television, playing on the computer and electronic games (Jull *et al.*, 2011). A reduction in sedentary activity with or without a combination of increased physical activity and dietary management in obese children could result in reduction of BMI, total body fat, waist circumference and skinfold thickness (Leung *et al.*, 2012). In addition, an increase in physical activity was found to confer positive effects on children's cardio metabolic health (Salmon *et al.*, 2011).

There are limitations to the study. Our study used a convenient sample of dietitians in MOH hospitals and teaching hospitals

who agreed to participate in this study. However, the selected hospitals provide dietetic service for the management of childhood obesity as most cases of childhood obesity are referred to these hospitals. The hospitals also have more than two dietitians and most of the hospitals do have dietitians assigned to specific dietetic areas such as pediatrics (which covers childhood obesity), renal, medical and others. In addition, the dietitians recruited into the study were selected based on years of practice in childhood obesity management. These criteria and the high response rates (70.2%) could lend the findings being representative of dietetic practice in Malaysia. Secondly, the study used only three practice guidelines from other countries for comparison. These guidelines, however, are evidence-based information that are regularly updated and adopted as a standard practice by dietitians in their respective countries.

## CONCLUSION

In conclusion, the management of childhood obesity in the clinical setting of Malaysia is diverse. Therefore, a comprehensive nutrition practice guideline is urgently needed. The comparison between current dietetic practices in Malaysia and other practice guidelines reveals that the current dietetic practices in our clinical setting did not include waist circumference, biochemical parameters, blood pressure and specific diets and physical activity prescriptions. It is imperative that the proposed nutrition practice guideline for management of childhood obesity in Malaysia include these components so as to be consistent with dietetic practices in other countries.

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## Conflict of interest

The authors report no conflict of interest.

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