

# Dietary Practices among Overweight and Obese Chinese Children in Kota Bharu, Kelantan

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## ABSTRACT

**Introduction:** Obesity and chronic diseases have been increasing since the last few decades alongside rapid economic development in developed and developing countries. The alarming increase in the prevalence of childhood obesity had been shown by many epidemiological studies worldwide. The aims of this study were to determine the prevalence of overweight and obesity among Chinese school children in Kota Bharu, Kelantan, and to map the association between dietary practices and their nutritional status. **Methods:** A cross-sectional study was conducted on 278 school children aged 10 to 12 years old (144 boys and 134 girls) studying in a Chinese primary school in Kota Bharu. **Results:** The survey revealed that while only 1.4% (n=4) were overweight, 23.4% (n=65) of the children were obese. A total of 67.7% (n=44) of the obese children were boys. The overweight and obese children (n=70) were compared with a randomly selected group of normal weight children (n=70). Dietary assessment showed that protein, fat and total calorie intake were significantly higher among the overweight group ( $p<0.05$ ). A significantly higher proportion of the normal weight children (85.7%) took breakfast daily or at least 4 days per week compared to the overweight groups (59.4%) ( $p<0.05$ ). **Conclusion:** The prevalence of obesity among school children in the study is a matter of concern. These findings may be useful in targeting programmes and strategies for prevention and intervention of childhood obesity.

**Keywords:** Chinese, obesity, school children

## INTRODUCTION

The World Health Organization (WHO) defines obesity as the “abnormal or excessive accumulation of fat in adipose tissue to the extent that health may be impaired” (WHO, 2000). The prevalence of overweight and obesity has been on the rise at an alarming rate since the last decades. Obesity is now

one of the most common nutritional problems among adults and children worldwide.

Increasing numbers of children worldwide are estimated to be overweight or obese; the International Obesity Task Force (IOTF) in 2003 reported that among children aged 5 to 17 years, 1 out of 10 children is overweight or obese. WHO

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estimates that 43 million children under the age of 5 years will be overweight in 2010 (WHO, 2009). The prevalence of childhood obesity is reported to be in the range of 14 to 20% in industrialised countries, but a rapid increase in numbers has been observed in developing countries such as Chile and China (WHO, 2000).

Overweight and obesity among school children have been reported in many Asian countries, including Malaysia. In year 2000, the Singapore School Health Survey reported that the prevalence of obesity in children aged between 12-13 years and 15-16 years was 14.7% and 13.1%, respectively (School Health Services (Singapore), 2000). A study conducted in an urban area in the Northeast of Thailand revealed that obesity prevalence among 7-9-year-old school children was 10.8% (Langendijk *et al.*, 2003). The latest Third National Health and Morbidity Survey (IPH, 2008a) reported that the prevalence of overweight in children aged below 18 years in Malaysia is 5.4%, with the highest prevalence in the 7-12 age group.

The escalating numbers indicate that serious attention is needed to curb this problem. Childhood obesity is often linked with devastating effects with significant impact on physical and psychological well-being. Similar to obesity among adults, the condition is usually accompanied by other risk factors such as hypertension, hyperglycemia, dyslipidemia and hyperinsulinemia in children (Freedman *et al.*, 1999). According to Daniels *et al.* (2005), obese children were found to have a higher frequency of psychological disorders such as depression.

In Malaysia, childhood obesity and overweight prevalence differs across gender and ethnic groups. According to Mohd Ismail *et al.* (2009a), obesity and overweight prevalence among school children nationwide in 2008 ranged from 18.4% among the Indians to 16.7% among Malays and 14.8% among Chinese. Malaysians practise different dietary habits and methods

of food preparation according to their ethnicity. Thus, studies focusing on specific ethnic groups may be useful to relate their dietary habits with nutritional status. This survey assessed the relationship between nutritional status particularly obesity and dietary habits among Chinese primary school children aged 10 to 12 years living in an urban area.

## METHODS

### Study background

A Chinese primary school located in Kota Bharu town area was selected through purposive sampling for this cross-sectional study. This school was selected out of 3 Chinese primary schools in the area. Permission to conduct the study was obtained from the school's administration department. Ethical approval was granted by the research committee of Universiti Sains Malaysia. Written informed consent was obtained from the parents and verbal consent was obtained from the children for measurement procedures and answering the questionnaires.

### Sampling method

Based on a study conducted in year 2001 on primary school children by Mohd Ismail *et al.* (2009b), the prevalence for school children aged 10 to 12 years who were at risk of overweight was 21%. The prevalence was almost similar for the three main ethnic groups. Thus, the minimal sample size calculated based on the formula by Daniel (1999) was 255 respondents.

$$n = \frac{Z^2 p (1-p)}{d^2}$$

where

$n$	=	estimated sample size
$Z$	=	standard value at confidence level at 95%
	=	1.96

$p$  = estimated prevalence for at risk of overweight among primary school children aged 10 to 12 years in Malaysia  
 = 21%  
 $d$  = margin error set at 5%  
 = 0.05

Thus

$$n = \frac{1.96^2 \times 0.21(1-0.21)}{0.05^2}$$

$$= 254.9$$

$$= 255$$

By taking into account a 10% drop-out rate, the desired sample size for this study was 281 children. Few classes had been randomly chosen from Standards 4, 5 and 6. Stratified sampling method was applied in order to select a sufficient number of classes from each Standard. Finally, seven classes were chosen randomly from a total of sixteen classes. There were 278 children who were included in this study. This number involved 43.4% of the total 641 students aged 10 to 12 years in the school.

After data collection was completed, the respondents were divided into four categories according to their body weight status. The Body Mass Index (BMI)-for-Age Growth Chart (de Onis *et al.*, 2007) was used as the standard reference to determine the nutritional status of the students. A child was categorised as underweight or having low BMI-for-age if his BMI-for-age was in the <5<sup>th</sup> percentile. Subjects with BMI-for-age between 85<sup>th</sup> percentile and 94<sup>th</sup> percentile were considered as overweight, while those with BMI-for-age  $\geq 95^{\text{th}}$  percentile were considered obese. These cut-off points are recommended by the expert committee for childhood obesity (Barlow *et al.*, 2007) whereby 'at risk of overweight' is replaced by 'overweight'. This is because overweight refers to high weight from lean body mass and high body fat levels with minimal health risks. The term 'at risk of overweight' was

originally used to avoid stigmatisation against children. When BMI is  $\geq 95^{\text{th}}$  percentile, 'obesity' is used instead of 'overweight' because 'obesity' explains excess body fat more accurately and reflects the associated health risks better than the term 'overweight', which is not accepted as a clinical term for high adiposity.

### Data collection

A self-administered questionnaire was used to collect information. The investigators were present in the classroom to assist respondents so that the questions were fully understood and well-completed.

A SECA Bodymeter (Germany) was used to measure the height of respondents without wearing shoes. Their body weight was taken using a clinical weighing scale (Kubota, Japan). All of them were weighed with their uniforms on, without shoes or any accessories and their pockets emptied. They were requested to stand in the middle of the weighing scale platform, with their heads looking straight to the front and their arms hanging loosely on each side of the body. Measurements were taken by trained investigators and the scale was calibrated before each session. Height and weight measurements were utilised to calculate BMI value which is an indicator of nutritional status using the 2007 WHO BMI-for-Age Growth Chart (de Onis *et al.*, 2007).

Respondents' dietary habits were investigated using a 3-day food record (2 consecutive weekdays and 1 weekend day). They were given a briefing on how to estimate the portion sizes of foods and beverages consumed using food models and household measurements like bowls, cups, plates, glass and spoons. Respondents were requested to record in detail the type of foods they consumed and their quantity as well as portion size. NUTRICAL software Version 1.01 was used to calculate the calories and nutrient contents of each food and beverage consumed.

**Table 1.** Mean anthropometric measurements and BMI for boys (n=144) and girls (n=134)

<i>Anthropometric measurements</i>	<i>Boys (n=144)</i>	<i>Girls (n=134)</i>	<i>p-value</i>
Weight (kg)	39.0 ± 11.4	38.2 ± 9.3	0.515
Height (cm)	142.1 ± 8.8	143.5 ± 7.7	0.164
BMI (kg m <sup>-2</sup> )	19.0 ± 4.1	18.4 ± 3.5	0.165

### Statistical analysis

The data collected were analysed using Statistical Package for the Social Sciences Version 12.0 (SPSS 12.0). Independent unpaired *t*-test and Chi-square test were used to compare the obese group and normal weight group. The level of significance was set at  $p < 0.05$ .

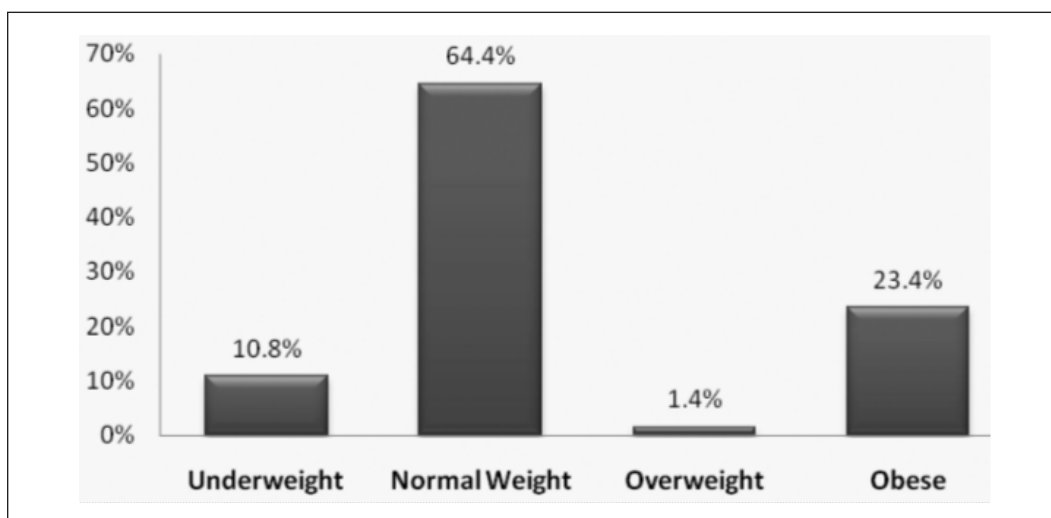
### RESULTS

Of the total respondents (n=144), 51.8% were boys, hence the study had almost equal representation in terms of sex. Table 1 shows the mean value of weight, height and BMI among the respondents. There were no significant differences in all the anthropometric measurements between boys and girls. Figure 1 shows the nutritional status of all respondents. A total of 1.4% (n=4) of the respondents were overweight

while another 23.4% (n=65) were obese. Of these 65 obese subjects, 67.7% (n=44) were boys. Table 2 demonstrates the nutritional status of the respondents by sex and age. The Chi-square test showed that the prevalence of obesity was only significantly different between 11-year-old boys and girls ( $\chi^2 = 12.58$ ,  $p < 0.05$ ).

### Dietary practices

All the overweight (n=4) and obese (n=65) respondents were then categorised as the 'Obese Group', involving a total of 47 boys and 22 girls. Meanwhile, another 70 respondents (47 boys and 23 girls) with normal body weight were randomly selected to form the 'Normal Weight Group'. It was found that the obese group skipped breakfast more frequently than the normal weight group, and the difference was significant ( $\chi^2 = 13.84$ ,  $p < 0.05$ ) (Table 3). However, there

**Figure 1.** Nutritional status of all respondents (n=278)

**Table 2.** Nutritional status of respondents according to sex and age

Body weight	Boys (n=144)			Girls (n=134)			Total (%)
	10 years (n=53)	11 years (n=64)	12 years (n=27)	10 years (n=55)	11 years (n=51)	12 years (n=28)	
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	
Underweight	7 (2.5)	6 (2.2)	5 (1.8)	6 (2.2)	1 (0.3)	5 (1.8)	30 (10.8)
Normal	34 (12.2)	34 (12.2)	11 (4.0)	43 (15.5)	46 (16.5)	11 (4.0)	179 (64.4)
Overweight	0 (0.0)	1 (0.3)	2 (0.7)	0 (0.0)	0 (0.0)	1 (0.3)	4 (1.4)
Obese	12 (4.3)	23 (8.3)	9 (3.2)	6 (2.2)	4 (1.4)	11 (4.0)	65 (23.4)
Total	53 (19.1)	64 (23.0)	27 (9.7)	55 (19.8)	51 (18.3)	28 (10.1)	278 (100.0)

**Table 3.** Frequency of breakfast consumption among obese group vs. normal weight group

Frequency of breakfast consumption / week	Obese group	Normal weight group
	n (%)	n (%)
7 days	35 (50.7)	45 (64.3)
4 – 6 days	6 (8.7)	15 (21.4)
1 – 3 days	17 (24.6)	7 (10.0)
Never	11 (16.0)	3 (4.3)
Total	69 (100.0)	70 (100.0)

( $\chi^2=13.84$ ,  $p<0.05$ )

was no significant difference in the frequency of lunch and dinner intake. A total of 16.0% (n=11) of the obese group skipped breakfast daily.

The mean daily intakes for energy, protein, fat and carbohydrates are presented in Table 4. The mean energy intake was significantly different between the two groups ( $p<0.05$ ). The mean daily energy intake for the obese and normal weight groups was 105.8% and 92.4% of the Recommended Nutrient Intakes for Malaysia (RNI) (NCFFN, 2005), respectively. Obviously, the obese group had exceeded the RNI for energy recommended for their age group. There was a significant positive correlation between energy intake and BMI among the respondents ( $p<0.05$ ).

Similarly, protein intake for the obese group was significantly higher compared to the normal weight group ( $p<0.05$ ). In fact,

obese group and normal weight group had achieved 191.2% and 136.3% RNI, respectively. Protein intake was significantly correlated with BMI ( $p<0.01$ ).

Fat consumption in the obese group was also significantly higher ( $p<0.05$ ). A relationship was also found between fat intake and BMI ( $p<0.01$ ). However, there was no significant difference in carbohydrate intake between the two groups, although the intake was higher in the normal weight group.

The Acceptable Macronutrient Distribution Ranges (AMDR) for children aged 4 to 18 years are 25 – 35 % for fat and 45 – 65 % for carbohydrates (National Academy of Sciences, 2005). It can be observed that fat and carbohydrate intakes were in the acceptable range except for fat intake in the obese group that had slightly exceeded the recommended range (35.5%).

**Table 4.** Overall daily nutrient intake obtained by 3-day food record

<i>Nutrient</i>	<i>Group</i>	<i>Mean ± SD</i>	<i>RNI (%)</i>	<i>Macronutrient distribution (%)</i>	<i>p-value</i>
Energy (kcal)	Obese	2153 ± 772	105.8	-	0.016
	Normal weight	1880 ± 516	92.4	-	
Protein (g)	Obese	87 ± 42	191.2	16.1	0.000
	Normal weight	62 ± 21	136.3	13.2	
Fat (g)	Obese	85 ± 41	-	35.5	0.003
	Normal weight	67 ± 24	-	32.3	
Carbohydrates (g)	Obese	261 ± 82	-	48.4	0.740
	Normal weight	256 ± 74	-	54.5	

## DISCUSSION

Globalisation and urbanisation have caused rapid changes in lifestyles in developing countries including Malaysia. These include significant changes in dietary intake and low physical activity due to the increased sedentary lifestyles (Tee, 1999). Often termed as 'nutrition transition', alterations in diets such as high-fat and energy-dense diets with significant amounts of animal-based foods have gradually displaced the traditional plant-based diets. Alterations in diet as well as work and leisure patterns are associated with an increase in the prevalence of diet-related non-communicable diseases including obesity even in the poorest countries (WHO, 2003).

A study by Anuar Zaini *et al.* (2005) found that 22.6% of Malaysian primary school children comprising Malays, Chinese and Indians were overweight and obese. The prevalence of overweight was higher among Chinese students (23.0%) compared to Indians (16.0%) and Malays (14.8%), whereas the prevalence of obesity was higher in Malays (7.6%), followed by Indians (5.1%) and Chinese (1.6%).

An explanation for the markedly higher proportion of obese than overweight children in this study may be due to the relatively high socio-economic status, given the

parents' average monthly income being RM2,700. Some Chinese families may still have the perception that being 'fat' is a sign of prosperity, success and good health (Lee, 1991). Thus, Chinese children are encouraged to eat more by their parents.

Nevertheless, the increased prevalence of childhood obesity should be monitored closely, as childhood obesity is known to be a predictor of obesity in adults. Multiple causes contribute to the development of obesity, including genetics, environmental factors, lifestyle patterns such as dietary habits and physical activity (Dehghan, Akhtar-Danesh & Merchant, 2005).

Overweight and obese children in the present study were more likely to skip breakfast compared to their peers with normal body weight. Moy, Gan & Siti Saleha (2006), who carried out a study on school children and adolescents in Kuala Lumpur, reported that BMI was significantly linked to meal skipping, particularly breakfast. An earlier study has shown that children and adolescents who skipped breakfast have higher BMI and a higher risk of obesity compared to those who took breakfast regularly (Keski-Rahkonen *et al.*, 2003). The possible explanation to this may be related to increased fat intake and snacking during the day when breakfast was not consumed (Ma *et al.*, 2003). Breakfast is an important component of nutritional well being because



it contributes significantly to total daily energy and nutrient requirements (Nicklas *et al.*, 1993). Ma *et al.* (2003) also reported that skipping breakfast was significantly linked to obesity as individuals who skipped breakfast tend to be hungry and may over eat during the next meal. Furthermore, habits like frequent snacking, skipping of lunch and a sedentary lifestyle had been observed to be more common among individuals who skipped breakfast (Keski-Rahkonen *et al.*, 2003).

Reasons for skipping breakfast given by the children in this study include no appetite in the morning, no breakfast was prepared, no time for breakfast and the lack of awareness on the importance of breakfast. The habit of skipping breakfast after many hours of fasting during sleep is worrisome because the first meal of the day is important to replenish energy in order to start a new day.

The obese group in this study consumed significantly larger amounts of total calories, protein and fat compared to the normal weight group. Hensrud (2004) reported that causes of increased energy intakes include larger portion sizes, eating in restaurants and away from home, eating late at night, instant-availability of energy-dense foods and fast foods and frequent snacking. Likewise, people will tend to eat larger amounts of foods when more time is spent on eating as well as when more food is served or readily available. The improvement in financial situations as well as extra earnings from the dual-income of working parents also raised purchasing power, where more money is readily available to purchase more food.

There are relatively few studies focusing on the association between protein consumption and prevalence of obesity. A study on children and adolescents conducted by Hermanussen, Sichert-Hellert & Kersting (2008) found a significant positive correlation between BMI and intake of overall protein ( $p < 0.01$ ) and animal protein ( $r = 0.151$ ,  $p < 0.01$ ). Meanwhile, the findings

by Trichopoulou *et al.* (2002) suggest that protein intake is conducive to obesity and may be the underlying reason for the escalating rates of obesity. Evidence suggests that high-protein meals stimulate the central nervous appetite regulation, thus promoting increased energy intake (Hermanussen *et al.*, 2008).

A positive relationship was found between dietary fat intake and adiposity in children (Maffeis *et al.*, 2000). Jequier (2001) also reported that frequent consumption of high-fat diet is one of the causes for weight gain. Furthermore, the consumption of high fat diets increases total energy intake and the excess fat is stored at a greater efficiency than similar excesses of dietary carbohydrates or protein (Hill, Melanson & Wyatt, 2000). High-fat and energy-dense foods stimulate passive over-consumption where sensory signals of satiety cues could not be recognised, therefore making a person susceptible to becoming overweight by ingesting extra calories than needed (Viskaal-van Dongen *et al.*, 2008).

## CONCLUSION

Childhood obesity is a public health problem in Malaysia and it needs to be addressed urgently. This study has shown that breakfast skipping as well as excessive intake of calories, protein and fat are associated with obesity among primary school children. Therefore, effective prevention and intervention strategies should be carried out to combat the problem before it becomes an epidemic. Prevention of childhood obesity is a positive step in preventing obesity in adults.

## RECOMMENDATIONS

Unhealthy dietary habits of skipping breakfast and eating high-caloric, high fat meals should be avoided at a very young age. Children should be encouraged to consume a nutritious and balanced breakfast to start the day. Moreover, meals

inclusive of complex carbohydrates and dietary fibre particularly whole grain and its products, fruits and vegetables are beneficial and should be cultivated from young. Consumption of free sugar should also be controlled because a high intake of sugar contributes substantial amounts of energy without providing any nutrients, culminating in a positive energy balance.

As children are dependents, parents and care-givers should take the initiative to prepare balanced meals for their children daily. A healthy and active lifestyle that includes appropriate dietary habits and physical activity should be promoted to children by parents, teachers and the mass media. Education and reinforcement of the importance of a healthy eating behaviour and physical activity could also benefit the children and their families.

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