

# Dietary Characteristics of Hong Kong Young Children: Implications for Nutrition Education

LL HUI, EAS NELSON

## Abstract

**Objectives:** To examine the dietary pattern of Hong Kong young children and its implication for nutrition education. **Methods:** Dietary patterns of 316 children aged 6-7-years (121 overweight, 130 middle-weight and 65 low-weight children), were assessed by a standardised questionnaire and a 3-day dietary record. **Results:** Macronutrient composition (carbohydrates: 53%; proteins: 16% and fats: 31%) was similar in the three weight groups and in line with recommendations. Our subjects mainly consumed proteins from animal sources. Seventy-nine percent of the subjects reported routine snacking during school breaks and fat from snacks (22%) was higher than that reported in 1993 (15%). An inadequate vegetable (84 g/day) intake was observed. Absence of vegetables during lunch was reported by 22% of subjects and this was associated with eating out. **Conclusion:** Further nutrition education in young children in Hong Kong should focus on healthy choices of snacks, balancing animal and plant sources of proteins and adequate consumption of vegetables and fruits. The need for healthy school lunch and snack programmes should be emphasised.

**Key words** Children; Diet; Nutrition; Overweight

## Introduction

The importance of a balanced diet for young children is obvious in terms of promoting health and optimal growth. However promotion of healthy eating is not easy in modern society where children are confronted with abundant, often unhealthy, food choices. Nutrition-related problems among 7-year-old children reported in a 1993 Hong Kong nutritional and growth survey included high serum cholesterol levels and high protein consumption.<sup>1</sup> In Hong Kong the prevalence of childhood overweight<sup>1</sup> and type II diabetes<sup>2</sup> is on the increase. Strategies to tackle these trends will include nutritional awareness programmes to encourage

healthy eating habits from a young age. Development of such programmes requires knowledge of current nutritional problems and flawed dietary habits. In 2000, a case-control study was undertaken to identify risk factors for childhood overweight and obesity in Hong Kong Chinese children aged 6-7 years old.<sup>3</sup> We now report descriptive information on the dietary habits and patterns of this study sample.

## Methods

### Subjects

Subjects participating in a case-control study to identify risk factors of childhood overweight were recruited from primary-one students (age 6-7 years) who were attending one of 12 Student Health Service Centres of the Department of Health for their annual body check during the period February 2000 to May 2000.<sup>3</sup> We developed Body Mass Index (BMI, weight in kg/height<sup>2</sup> in m<sup>2</sup>) cutoffs from previous 1993 cross-sectional Hong Kong growth survey data.<sup>4</sup> These cutoffs identified the 8% of children who were classified as overweight in this previous study, as well as the 10% of children in the middle weight group and the 8%

Department of Paediatrics, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, N.T., Hong Kong, China

LL HUI (許麗玲) MPhil  
EAS NELSON (倪以信) MBChB, MD, FHKCPaed

Correspondence to: Dr EAS NELSON

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with the lowest weights. In this way, three groups of subjects were identified and recruited: an overweight group ( $\geq 92$ nd centile for BMI); a middle-weight group (45th-55th centile for BMI); and a low-weight group ( $\leq 8$ th centile for BMI). The BMIs of the 6-7 years old students were calculated from their weight (to the nearest 0.1 kg) and height (to the nearest 0.1 cm) measured by nursing staff at the Student Health Service Centres. We did not intend to recruit a random sample for this study but instead three distinct weight groups.

#### **Data Collection**

Each participant was visited at home where a face-to-face interview was carried out to collect information on demographic data, lifestyle characteristics and dietary practice. Food intakes of children were examined using 3-day dietary recording method. Names, serving sizes, cooking methods and the brand names of all foods consumed over three days (two weekdays and one weekend) were recorded on a set of standard recording sheets which were posted prior to the home interview. During the home visits the completed 3-day dietary record sheets were collected by the interviewer. Data on the record sheets were checked and any vague information was clarified with the families or the children using coloured food pictures and simple utensils, such as tablespoons, teaspoons and glasses.

#### **Assessment of Food and Nutrient Intake**

Food data from the 3-day dietary record was computer entered using the professional edition of the SERVE Nutritional Management System for windows® (M & H Williams Pty Ltd).<sup>5</sup> A Hong Kong food composition table based on food tables from Britain, China, Taiwan, and US<sup>1</sup> was specially incorporated into the SERVE program for assessing the energy intake, macronutrient intake and food intake over the 3 days.

#### **Statistical Method**

Simple logistic regression was used to assess the difference of energy and macronutrient intake of overweight and middle-weight children with overweight as the dependent variable. The differences among groups were assessed by chi-square tests (for categorical variables) and ANOVA (for continuous variables). All the statistical analyses were done by SPSS, the Statistical Package for Social Sciences (SPSS for Windows, versions 10.1 and 11.0; SPSS Inc., Chicago, United States).

This study was approved by the Ethics Committee of The Chinese University of Hong Kong and written informed consent was obtained from the parents of all subjects.

## **Results**

The mean age of the subjects was  $6.7 \pm 0.3$  years. The mean BMI for the overweight ( $n=121$ ), middle-weight (130) and low-weight (65) groups were  $20.5 \pm 2.1$  kg/m<sup>2</sup>,  $15.0 \pm 0.2$  kg/m<sup>2</sup> and  $12.8 \pm 0.3$  kg/m<sup>2</sup> respectively. There was no significant difference in the BMI between male and female subjects in each weight group. Ninety-eight point five percent of the children in the overweight group met the international cut-off for overweight (equivalent to 25 kg/m<sup>2</sup> in adults) derived by Cole et al.<sup>6</sup> All but one of the children in the low weight group was within Hong Kong normal weight range (80-120% median weight-for-height).

#### **Dietary Practice**

*Main meals:* The usual frequency of having three meals and snacks in-between meals was reported by the parents/caregivers. Thirteen percent of our subjects "skipped breakfast", which was defined as having breakfast (anything that contained energy) less than three times a week. There was no significant difference found among different weight groups. Twenty-two percent of children were seldom or never provided with vegetables during lunch while 99% of the parents claimed that vegetables were always available at dinner. Absence of vegetables during lunch was associated with eating out for lunch three times or more per week. Fruits were available daily for 93.3% of subjects. Parents/caregivers were asked to pick the most preferred and most disliked food group of the children from seven categories: cereal; fish; meat; vegetables; fruits; milk products & eggs; and dessert. Meat (30%) was the most preferred food and vegetables (27%) were the most disliked.

*Snacking:* Seventy-nine percent of subjects reported that they always had food during school breaks and 87% of them brought their snack from home. Eighty-two percent reported some restriction on snacking in terms of snacking time, type of snack and amount of snack. Frequency of eating snacks while watching television was evaluated. Eating breakfast, lunch or dinner while watching television was not counted as a snack. Eighty-five percent of subjects seldom or never requested a snack while watching television and 83% said unhealthy junk foods (i.e. foods with high fat or high sugar content) were seldom or never given at this time.

*Eating out:* Eating out was defined as almost all food served during a meal was prepared or bought from outside stores. Take away meals bought from restaurants and having school lunch boxes were therefore counted as eating out. Results showed that 6.7%, 27%, 2% of breakfast, lunch

and dinner meals were eaten out 3 times/week or more respectively. Chinese-style restaurants and Western-style fast food restaurants were the most frequently visited venues with respectively 36% and 26% of families visiting one or more times per week.

**Nutritional Supplements:** Respectively 67%, 88% and 86% of overweight, middle-weight and low-weight children had ever been given nutritional supplements. Significantly fewer overweight children were ever given supplements ( $p < 0.0001$ ). Among fish oil, vitamin C, multi-vitamins and calcium, fish oil was the most popular supplement. Sixty-nine percent had ever been given fish oil, and 44% of the children started taking these supplements before three years of age and 41% had received the fish oil supplements for more than one year.

### Food and Nutrient Intake

**Energy & Macronutrients intake:** Average energy intake was generally higher in boys than girls (Table 1). The overweight group had a higher total energy intake but the lowest energy intake per kg of weight. Percentage energy from carbohydrate, protein and fat were on average 53%, 16% and 31% respectively. Twelve percent of the overweight children had an energy intake greater than that recommended (1850 kcal/day for children aged 5-7 with median weight 20.5 kg).<sup>7</sup>

The mean saturated fat, monounsaturated fat, polyunsaturated fat, cholesterol intakes and P/S ratio (polyunsaturated fat intake : saturated fat intake) were not different among the weight-groups nor between the different sexes (Table 2). The range of cholesterol intake was wide

**Table 1** Energy and macronutrient intake among the three weight groups.

	Daily energy intake (kcal)	Energy intake per kg weight (kcal)	Average intake (g)		
			Carbohydrate	Protein	Fat
Overweight group					
Boys n=63	1581±300	51±12	209±47	66±17	55±15
Girls n=58	1458±301	50±12	190±44	56±16	53±13
Middle-weight group					
Boys n=64	1494±263	71±13	202±37	61±17	51±14
Girls n=66	1443±256	72±12	194±40	60±16	49±13
Low-weight group					
Boys n=24	1418±246	79±13	203±40	59±16	50±12
Girls n=41	1394±272	82±18	186±38	57±14	49±14
Average					
Boys	1518±281	64±17	203±40	63±17	52±14
Girls	1435±276	67±19	190±40	59±16	50±13
All	1475±281	65±18	197±40	61±16	51±14
Range	745-2393	28-113	85-295	22-143	18-108

**Table 2** Fat intake among the three weight groups

	Daily fat intake (g/d)			P/S ratio	Daily cholesterol intake (g/d)
	Saturated fat	Mono-unsaturated fat	Poly-unsaturated fat		
Overweight group					
Boys n=63	18±5.9	20±5.2	11±3.0	0.55±0.11	283±103
Girls n=58	18±5.4	19±5.3	10±3.0	0.57±0.17	272±114
Middle-weight group					
Boys n=64	18±6.0	18±5.5	9.1±2.6	0.52±0.11	261±118
Girls n=66	16±5.0	18±4.7	9.9±2.8	0.58±0.12	265±111
Low-weight group					
Boys n=24	17±5.2	19±5.3	9.5±2.5	0.54±0.11	265±82
Girls n=41	17±6.4	17±4.8	9.2±2.4	0.56±0.14	244±100
Average	17±5.7	18±5.2	9.9±2.8	0.55±0.13	266±108
Range	4.6-42	4.8-42	3.2-21	0.32-1.18	37-746

and 35% of children had cholesterol intakes over 300 mg/d. The proportion of energy from different meals was similar for the macronutrient distribution. The majority of the energy and macronutrients intakes were from the lunch (29%) and dinner (31%). Energy intake outside the three main meals, i.e. snacking, during morning, afternoon and evening contributed respectively 4.5%, 13.4% and 4.1% of the total energy intake. Snacking contributed 22±10% of the total energy intake which is more than that from breakfast (18%). Ninety-five percent of subjects consumed at least one afternoon snack within the three days of diet recording.

**Food consumption:** Cereal foods provided the greatest amount of energy (about 43%) in all three weight-groups (Table 3). Meat and poultry provided the second greatest amount of energy (18% in overweight group and 15% in both middle-weight and low-weight groups). Beverages (6%), dessert (4-5%) and confectionary (1-3%) provided about 12-14% of daily energy intake. The average vegetable and fruit consumption were 84 g/day and 97 g/day respectively. Meat and poultry provided the greatest proportion of both fat (32%) and protein (39%) in diets (data not shown in the table). Added fat, mainly spreading and cooking oil provided the second greatest proportion of fat (17%) while fish and seafood was the second most important source of protein (14%). Milk and milk products provided the third largest proportion of both fat (12%) and protein (10%).

The average energy contribution from beverages and milk was respectively 8.8%, 10% and 11% for the overweight, middle-weight and low-weight groups. According to the consumption frequency, on average, each child at the age of 6-7 had 408 ml of sugary drinks and 0.8 can of soft drinks (355 ml) per week. Among those who had milk during the 3-day dietary recording, 92% of them had full cream milk and the rest had skimmed milk. Forty-three percent had at least one glass (250 ml) of full cream milk every day during the three-day dietary record.

#### **Comparison With 1993 Growth and Nutrition Study**

Age, mean weight, height and BMI of the subjects in the middle-weight group of this present study were comparable with the 7-year-old sample of the 1993 Hong Kong growth and nutrition study (Table 4). The absolute daily energy intake was lower in boys but similar in girls in this study when comparing with the 1993 data. However when adjusted for weight, our subjects had lower energy intake for both sexes. Fat intake was similar for both sexes while protein intake was 16 g lower in boys and 10 g lower

in girls in the present study. Proportion of energy consumed from snacks increased in this study while that from breakfast decreased. Saturated fat intake was higher while the P/S ratio was lower in this present study. The major source of fat was meat and poultry in both studies.

## **Discussion**

We previously identified high energy consumption as a risk factor for overweight in this study population.<sup>3</sup> However their macronutrient composition was not different from that of the normal weight group. From the 3-day dietary record, the distribution of energy from carbohydrates (53%), proteins (16%) and fats (31%) was similar among the three weight groups and attained the goals proposed by the Food and Environmental Hygiene Department of the Hong Kong SAR government<sup>8</sup> which are based on recommendations from World Health Organization and Food and Agriculture Organization.

Percentage energy from fat was lower than those of Mainland China [35% in 1992],<sup>9</sup> Japan [33% in 1994]<sup>10</sup> and the US [35% in 1994]<sup>11</sup> but similar to that of the seven-year-old sample in the 1993 Hong Kong study [29%].<sup>1</sup> Both the actual saturated fat intake and the poly-unsaturated fat were higher in our subjects compared with the 1993 data. However part of the difference might be due to the difference in fatty acids intake assessment methods (1993: chemical analyses, present study: deduced from food composition tables). The 1993 study showed that the children had high cholesterol levels prompting the recommendation that saturated fat consumption in Hong Kong children be reduced.<sup>12</sup> Although the cholesterol levels of our subjects are not known, it is estimated that 35% of them consumed more than 300 mg of cholesterol on a day. Promoting healthy food choice to avoid over-consumption of cholesterol among young children would seem desirable.

The amount of protein consumed in the young children in this study was twice the lowest safe protein intake recommendation from the U.S.<sup>7</sup> This finding is consistent with a previous report of relatively high protein consumption in Hong Kong children compared with Australian data.<sup>1</sup> Our data also suggested that the children mainly consumed proteins from animal sources. Plant sources of protein supplies fiber, vitamins and minerals and therefore it is good to balance the consumption of plant and animal sources of proteins among Hong Kong young children. When choosing animal proteins, children should be advised to choose those with less saturated fat.

**Table 3** Percentage energy contributed by food groups

	Daily intake		
	Overweight group	Middle-weight group	Low-weight group
<b>Cereal</b> n=316			
Amount (g)	436±120	429±109	399±95
Kcal (%energy)	707±193 (42%)	695±154 (44%)	653±163 (43%)
<b>Vegetables</b> n=311			
Amount (g)	89±68	83±60	78±42
Kcal (%energy)	48±47 (2.9%)	43±41 (2.7%)	39±37 (2.5%)
<b>Fruits</b> n=235			
Amount (g)	112±79	99±74	81±49
Kcal (%energy)	61±45 (3.7%)	58±45 (3.7%)	46±27 (3.0%)
<b>Meat</b> n=314			
Amount (g)	120±51	100±45	91±38
Kcal (%energy)	296±126 (18%)	245±117 (15%)	233±99 (15%)
<b>Fish</b> n=295			
Amount (g)	48±34	48±31	49±31
Kcal (%energy)	66±49 (4.0%)	63±41 (4.0%)	62±41 (4.0%)
<b>Milk/Milk pdt</b> n=234			
Amount (g)	142±137	154±137	187±132
Kcal (%energy)	108±89 (6.5%)	112±89 (7.1%)	136±88 (8.9%)
<b>Eggs</b> n=258			
Amount (g)	31±19	29±18	25±14
Kcal (%energy)	65±41 (3.9%)	63±42 (4.0%)	51±31 (3.3%)
<b>Lentils/Beans</b> n=208			
Amount (g)	26±25	29±29	26±23
Kcal (%energy)	27±29 (1.6%)	36±49 (2.3%)	26±25 (1.7%)
<b>Beverages</b> n=275			
Amount (g)	184±148	180±127	169±115
Kcal (%energy)	97±73 (5.8%)	100±68 (6.3%)	93±54 (6.1%)
<b>Dessert</b> n=146			
Amount (g)	52±35	53±37	51±39
Kcal (%energy)	67±40 (4.0%)	79±44 (5.0%)	69±44 (4.5%)
<b>Confectionary</b> n=119			
Amount (g)	9.6±10	7.2±9.4	13±18
Kcal (%energy)	38±56 (2.3%)	18±28 (1.1%)	48±94 (3.1%)
<b>Added fat</b> n=315			
Amount (g)	10±5	8.5±3.5	8.7±3.0
Kcal (%energy)	86±42 (5.2%)	74±29 (4.7%)	75±24.0 (4.9%)

Cereal includes grains, products made from flours or food with majority content made from carbohydrate rich ingredient; Vegetables includes all vegetables and mushrooms, but excluded pickled vegetables; Fruits includes fresh fruit juice, fresh, tinned and dried fruits; Meat includes pork, beef, lamb, poultry and offal from these animals; Fish includes all fish and seafood; Milk & Milk products include milk, cheese, yoghurts and other by-product of milk; Eggs includes eggs of different varieties; Lentils & Beans include bean curd, dried and fresh beans; Beverages include all diluted fruit juice, sweeten drinks, soft drinks but exclude milk; Dessert includes Chinese sweet soup, cream cake, ice-cream...etc; Confectionary includes chocolates and sweets; Added fat includes cooking oil and spreading.

**Table 4** Comparison of the nutrient intake with 1993 growth and nutrition study

	Middle-weight group of Present study	7-year-old subjects in 1993 nutrition study <sup>a</sup>
Mean age	6.63±0.3	7
Number of subjects		
Boys	71	70
Girls	68	55
Mean weight/kg		
Boys	21±1.6	20±3.3
Girls	20±1.5	19±3.2
Mean height/cm		
Boys	118±4.5	114±4.4
Girls	116±4.4	114±4.7
Mean BMI		
Boys	15±0.2	15±1.9
Girls	15±0.2	15±1.7
<sup>a</sup> Energy intake (kcal)		
Boys	1494±263	1655±379
Girls	1443±256	1415±331
<sup>a</sup> Energy intake per unit weight (kcal/kg)		
Boys	71±13	84±18
Girls	72±12	76±20
<sup>a</sup> Carbohydrate intake		
Boys	202±37	239±63
Girls	194±37	195±53
<sup>a</sup> Protein intake (g)		
Boys	61±17	76±21
Girls	60±16	69±21
<sup>a</sup> Protein intake per unit weight (g/kg)		
Boys	2.9±0.8	3.9±1.1
Girls	3.0±0.8	3.7±1.3
<sup>a</sup> Fat intake (g)		
Boys	51±14	52±38
Girls	49±13	44±16
<sup>a</sup> P/S ratio	0.55±0.12	0.69
<sup>b</sup> Major source of fat	Meat and poultry	Meat and poultry
<sup>b</sup> Distribution of fat intake in meals		
Breakfast, lunch, dinner, snack	19%, 27%, 32%, 22%	25%, 30%, 30%, 15%
<sup>b</sup> Fatty acids intake (g)		
Saturated fat	17±5.5	14±4.4
Mono-unsaturated fat	18±5.1	19±5.1
Poly-unsaturated fat	9.5±2.7	8.9±2.0

<sup>a</sup>Sources from reference no. 1, means were taken from data of 7 years old for comparison by using 3-day dietary record.

<sup>b</sup>Sources from reference no. 12, a dietary study on a subset of 20 seven-year old children in the 1993 growth and nutrition study by using chemical analyses on duplicated meals.

Energy contributed from beverages and milk was reported as 20% among US children aged 6-11 years,<sup>11</sup> which was almost double the percentage calculated from this study. The smaller energy contribution from beverages among our subjects was desirable and this could be due to their younger age and cultural difference. We did not record amount of water consumed among our subjects therefore how much of their fluid needs were provided by calorie-free beverages could not be deduced. Limiting energy contributed from sweetened beverages and using water to fulfill fluid needs should be encouraged in all children, especially for those suffer from obesity.

The average daily intake of vegetables and fruits calculated from the 3-day dietary record was less than the equivalent of, respectively, a tomato and an apple of small size. The amount of fruits consumed per day among our subjects approaches the suggested daily consumption amount recommended by the Hospital Authority dietetic information centre.<sup>13</sup> However consumption of vegetables was inadequate when compared with the recommendation (120-180 g/day).<sup>13</sup> Measures to increase the daily consumption of fruits and vegetables in this age group are warranted. Our data suggested that vegetables and fruits are widely available in most households but that their availability decreases if children frequently eat out for lunch, including having school lunch. The increasing number of full-day schools in the Hong Kong education system emphasises the need to establish a school lunch policy. In view of the fact that the lunch contributes 30% of total energy intake in our subjects, school lunches should provide food choices that contain a balance of nutrients and adequate amounts of fruits and vegetables.

About 80% of our subjects had afternoon snacks four times or more per week. Our study highlights the importance of emphasising healthy snack food choices, as opposed to the high-energy snacks that are commonly available to children. It should also be noted that the percentage of fat intake from snacks has increased from 15% in the 1993 study to 22% in the present study. Therefore, providing healthy snacks in the right portions is an important part of achieving a balanced diet in young children. Seventy-nine percent of our subjects always had a snack during school breaks, suggesting that primary schools can also play an important role in promoting healthy snacking through education programs and by increasing the availability of healthy snacks sold at reasonable prices.

Different from other studies,<sup>14</sup> most children in our study did not request snacks nor have snacks while watching television. According to parents, most children are so

focused on the television programmes that they do not bother to eat. Although snacking while watching television does not appear to be a problem in this age group, it would still be appropriate to limit television watching in favour of more physical pursuits.

Some limitations need to be considered when interpreting our findings. The selected group of children do not represent a spectrum of weight status but instead three distinct weight groups on the spectrum. Lack of a random population sample might affect generalisation of our findings. Dietary intakes vary day-by-day and thus the dietary information calculated from the 3-day dietary records might not be representative of usual nutrient intake of the subjects. Underreporting, especially for overweight children of unhealthy or "bad" foods might also underestimate the actual intake. It should also be recognised that the dietary habits of the children might have changed as a result of their weight status so that the current diet may not reflect the child's diet taken when the child was becoming overweight.

Primary schools play a potentially important role in nutrition education and in facilitating healthy eating practices among young children in Hong Kong. Areas to be targeted include the provision of healthy snack choices and ensuring the adequate intake of vegetables and fruits. Balancing animal and plant sources of proteins and promoting appropriate cholesterol consumption should be encouraged. However, moderation and variety, rather than food restriction, should be advocated among both normal weight and overweight children and their families.

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