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Weight Status and Dietary Intake among Female Children and Adolescents Aged 6-17 Years in a Welfare Home, Kuala Lumpur

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ABSTRACT

A cross-sectional study was conducted among 13 female children and 40 adolescents residing in a welfare home. The objectives of this study were to determine underweight, overweight rates and body fat percentages as well as assess the dietary intake of energy, selected macro- and micro-nutrients among the subjects aged 6-17 years. The anthropometric measurements collected were Body Mass Index (BMI) and skinfold thickness of five body sites - triceps, subscapular, abdomen, suprailiac, and thigh. Dietary intake was assessed using a 24-hour dietary recall. This study indicated that the majority (75%) of the subjects were of normal weight, 21% were underweight and 4% were overweight. BMI and body fat percentages of the adolescents were found to be significantly higher than those of the children ($t=-3.083$, $p=0.003$; $t=-7.321$, $p<0.001$). A positive correlation between BMI and body fat percentage was also significant ($r=0.791$, $p<0.001$). In terms of dietary assessment, there were significant differences in percentage of RNI attainment between children and adolescents for energy, protein, iron, and folate ($p<0.05$). In conclusion, the majority of the children and adolescents had normal weight and average body fat percentages. Besides, all the children met the RNI requirements for all the studied nutrients while the adolescents met the RNI requirements for energy, protein, iron, and zinc with dietary calcium and folate slightly below the RNI requirements.

INTRODUCTION

According to the United Nations Children's Fund (UNICEF), the number of overweight children is increasing at a rapid rate, with about 146 million underweight children are found in developing countries (Sherina & Rozali, 2004). These underweight children will be at a higher risk of being stunted and the overweight children will be at a higher risk of being obese in adulthood leading to the development of non-communicable diseases later in life. Besides, overweight children and adolescents are more likely to have a low level of aerobic power and performance fitness that may contribute to higher body weight and body fat levels. Furthermore, these unhealthy weight statuses will progress into adulthood and lead to huge economic costs in health and

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security system (Pon, Mirnalini & Mohd Nasir, 2004). Thus, studies on the weight status of children and adolescents are important to provide a better understanding for the implementation of weight management programmes in reducing both the numbers of underweight and overweight children in the country.

In the developing countries, mortality and morbidity for children aged less than five years are of major concern due to the general living standards and whether a population is able to meet its basic needs for food, housing and health care (De Onis *et al.*, 1993). It has been noted that growth retardation is highly prevalent in developing countries (De Onis, 2000). The well-known etiology of growth retardation in nutrition is inadequate intake of energy and protein (Mora *et al.*, 1981). However, the deficiencies of specific micronutrients such as iron, zinc, calcium and folic acid also play an important role in childhood growth retardation. In addition, other factors such as reliance on private donations and local food bank for food might cause children in most shelters and welfare homes to have an inadequate diet (Pauline, Williams & Lugo 2006). Besides, due to limited choices in food variety, children and adolescents in welfare homes may refuse to accept the food provided or have poor appetite for the food provided. Due to these reasons, problems of weight status and nutrient deficiencies among this group of people can be noteworthy. Therefore, there is a need to study the weight status and the dietary intake of energy and nutrients among the children and adolescents living in welfare homes.

MATERIALS AND METHODS

A welfare home, that is in Kuala Lumpur, was selected for this study. Formal permission was obtained from the management of the home and ethics approval was obtained from the research committee of UCSI before the conduct of this cross-sectional study.

Subjects and study location

This study was conducted among female children and adolescents of various races, who reside in the welfare home in Desa Petaling, a small suburb in Kuala Lumpur, Malaysia. This welfare home provides shelter to the underprivileged and homeless in addition to undertaking welfare projects wherever the need arises. A total of 53 female children and adolescents from the welfare home were recruited for this study. Female children and adolescents aged between 6 and 17 years old were selected to participate in this study. All participants selected for this study fulfilled the criteria of being healthy, not pregnant, not on any medication, special diet or restricted diet.

Anthropometric measurements

The measurement tools include a digital CAMRY personal scale Model EB9003 and a SECA Body meter Model 206, to measure the weight and height respectively. The digital personal scale CAMRY Model EB9003 was used to measure the weight of subjects to the nearest 0.1 kg. All subjects were weighed with light clothing, without accessories and shoes. The digital personal scale was calibrated to zero for each measurement. Each subject was asked to stand bare-footed on the middle of the weighing scale, with head looking straight to the front, arms loosely on the side. The SECA Body meter Model 206 was used to measure the height of subjects to the nearest 0.05 cm. All subjects were measured from head to heel with no cap and shoes.

Weight and height measurements were used to calculate the BMI value, an index of body weight status. BMI values were then used to categorise the weight status into the following categories: underweight, normal weight and overweight according to the BMI-for-Age Growth Chart (CDC, 2006). A BMI value below the 5th percentile was indicated as underweight, equal or above the 5th percentile; below the 85th percentile it was indicated as normal weight, equal or above the 85th percentile; below the 95th percentile, it was indicated as at risk of overweight; and equal or above the 95th percentile was indicated as overweight.

Skinfold thickness measurement

Skinfold thickness of five body sites including triceps, subscapular, abdominal (near the navel), suprailiac, and thigh, were measured by using a skinfold caliper. For each subject, skinfold thickness of each body site was measured twice. All duplicate measurements for the five body areas were recorded to the nearest 0.5 mm and the average value of each measured body area was added up as the sum of measurements. Body fat content in percentage of body weight of each subject was calculated from the sum of 5 measurements of skinfold thickness using the following equation (Fahey, Insel & Roth, 2005):

Body fat percentage of female = 0.29669 (sum of measurements) – 0.00043 (sum of measurements)^2 + 0.02963 (age) + 1.4072

24-hour dietary recall assessment

The 24-hour dietary recall was used to assess the dietary intakes of energy, protein, calcium, iron, zinc, and folate among the subjects. Each 24-hour dietary recall was conducted through an individual interview. During each interview session, the respondent was asked several probing questions to determine the food they consumed during the last 24 hours. The portion sizes of foods and beverages consumed were estimated using standard household measurements such as bowls, cups, plates, glass, and spoons and photos of selected dishes. Photos of food were provided to help in both memory recall and to identify the foods that children were unable to name. Detailed descriptions of all foods, beverages, vitamin and mineral supplements consumed in the past 24 hours were recorded at a room in the children's home. In order to perform calculations of nutrient contents of each food and beverage consumed, a commercial software, Diet 4, and the Nutrient Composition of Malaysian Foods (Tee *et al.*, 1997) were used to calculate the dietary intake of energy, protein, calcium and iron (Foo *et al.*, 2004). For the calculation of dietary zinc and folate intakes, the USDA Food Database was used as a reference.

Data analysis

The data collected was analysed using Statistical Package for Social Sciences (SPSS) for Windows version 12.0. Independent Sample T-test was used to compare the mean difference between selected variables. Chi-square was used to determine the relationship between the categorical variables. Pearson correlation was used to determine the correlation between continuous variables. The level of significance used for the data analysis was set at $p<0.05$.

RESULTS

A total of 53 female children and adolescents aged 6 to 17 were stratified in two age groups. There were a total of 13

Table 1. The distribution of study subjects by age group

Age group	*Mean ± SD*	*Number of subjects (n)*	*Percent (%)*
6-9	7.69 ± 1.25	13	25.0
10-17	12.68 ± 2.26	40	75.0
Total	11.45 ± 2.98	53	100.0

Table 2. The mean of weight, height, body mass index (BMI), and body fat percentage by age group

Variables	*Age group (years old)*	
	6-9	*10-17*
Weight, kg	23.38 ± 5.41	40.60 ± 10.27
Height, m	1.26 ± 0.11	1.50 ± 0.08
BMI (kg / m^2)*	14.63 ± 1.66	18.01 ± 3.81
Body fat percentage *	16.10 ± 4.16	22.12 ± 5.12

* Significantly different between age groups at $p<0.05$.

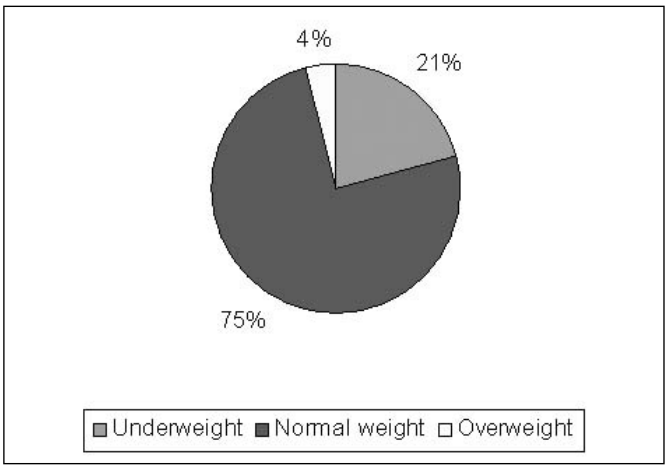

Figure 1. Weight status of study subjects

subjects (25%) in the 6-9-year-old age group and 40 subjects (75%) in the 10-17-year-old age group (Table 1). The mean BMI for children in 6-9-year-old age group was 14.63±1.66 kg / m^2 and the mean BMI for adolescents in 10-17 year old age group was 18.01 ± 3.81 kg / m^2. The average BMI value for the children differed significantly from that of the adolescents (t=-3.083, p=0.003) (Table 2).

By referring to the BMI-for-age Growth Chart developed by CDC (2006), 21 % of children and adolescents had BMIs below the 5th percentile, 4 % of children and adolescents had BMIs of above the 95th percentile and 75 % of children and adolescents had BMIs between the 5th and 95th percentiles. Therefore, the majority of the children and adolescents were of normal weight, 21% were underweight and a

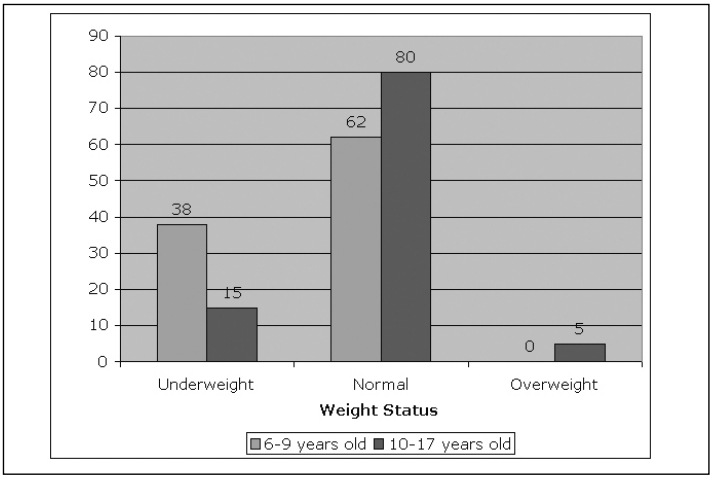

Figure 2. Weight status of study subjects by age groups

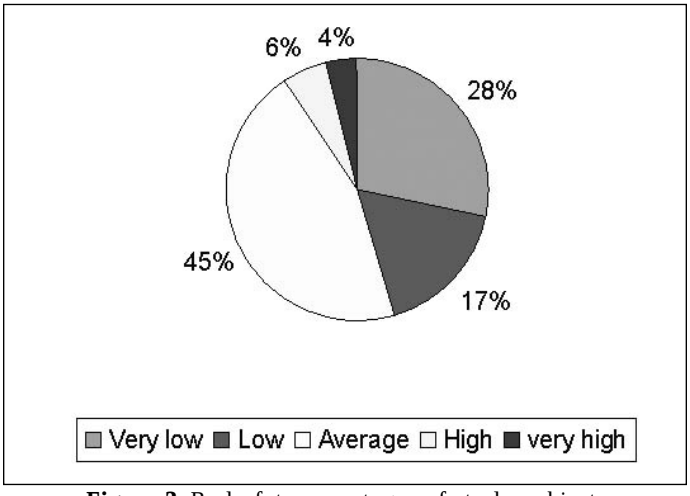

Figure 3. Body fat percentages of study subjects

Table 3. The mean of dietary intakes by age group

Nutrients	*6 – 9 years old*		*10 – 17 years old*		*Overall*
	*RNI**	*Mean± SD*	*RNI**	*Mean± SD*	*Mean± SD*
Energy, kcal	1290-1590	2411.59 ± 761.56	1990-2050	2275.62 ± 905.33	2308.97 ± 867.20
Protein, g	23-32	64.85 ± 21.11	46-54	62.55 ± 24.06	63.11 ± 23.10
Calcium, mg	600-700	777.81 ± 270.44	1000	860.67 ± 600.31	840.35 ± 537.08
Iron, mg	4-9	25.89 ± 9.40	9-31	28.10 ± 18.88	27.56 ± 16.97
Zinc, mg	5.1-5.8	14.75 ± 12.26	7.5	8.33 ± 10.97	9.91 ± 11.52
Folate, mcg	200-300	425.32 ± 72.48	400	371.08 ± 165.58	384.39 ± 149.43

Note: There was no significant difference in dietary intakes of energy and nutrients between the age groups.
* Based on Recommended Nutrient Intake s for Malaysia 2005 (NCCFN, 2005)

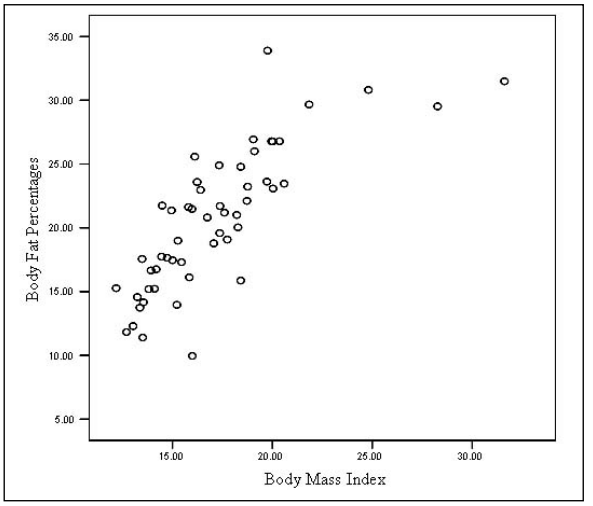

Figure 4. The significant positive correlation between Body Mass Index and Body Fat Percentage (r=0.791, p<0.001)

relatively small proportion, 4%, was overweight (Figure 1). The distribution of weight status between the 6-9-year-old age group and 10-17-year-old age group is presented in Figure 2. Both underweight and normal weight were found in both children and adolescents while overweight was only found in adolescents. There was no significant association between weight status and age group (χ^2 test at p= 0.158, p>0.05).

The mean (± SD) of sum of skinfold thickness and body fat percentage for the 6-9-year-old age group were 53.23±16.82 mm and 16.10±4.16% respectively. For adolescents in the 10-17-year-old age group, the mean (±SD) of sum of skinfold thickness and body fat percentage were 78.11±22.54 mm and 22.12±5.12% respectively. The distribution of body fat percentage of study subjects is presented in Figure 3. The overall mean (±SD) of sum of skinfold thickness and body fat percentage were 72.01±23.73mm and 20.64±5.52% respectively with the adolescents having a significantly higher mean body fat percentage compared to the children (t=-7.321, p<0.001) (Table 2). Therefore, adolescents in this study had higher body fatness compared to children. There was also a significant positive correlation between BMI and body fat percentage (r=0.791, p<0.001) indicating that BMI value increases as body fat increases (Figure 4).

The mean dietary intake of energy, protein, calcium, iron, zinc, and folate among children and adolescents according to age groups are presented in Table 3. Although there was no significant difference in the energy and nutrient intake between children and adolescents, the children recruited in this study had a dietary mean intake of energy, protein, zinc and folate that was higher than that of the adolescents. Adolescents only had a dietary mean intake of calcium and iron that was slightly higher than the children. The overall energy intake of the children and adolescents attained an RNI level which was 160.25±55.89% and 111.66±45.26% respectively. Apart from this, both children and adolescents had an overall percentage of RNI above 100% for all nutrients, except for dietary calcium and folate among adolescents.

DISCUSSION

Research by Panpanich *et al.* (1999) shows that children who stay in shelters or orphanage homes are more likely to be undernourished than non-orphans and orphanage girls were more likely to be malnourished than orphanage boys. Hence, the objectives of this study were to determine the underweight, overweight rates and body fat percentages as well as assess the dietary intake of energy, selected macro-and micro-nutrients among female children and adolescents residing in a welfare home. In this study, the majority (75%) of the children and adolescents fell within the normal BMI range value. Only a small percentage of children and adolescents had BMI values categorised as underweight or overweight. Among these small percentages, the percentage of underweight (21%) was higher than the overweight (4%). These results were found to be similar to a study by Aboud *et al.* (1991), who stated that there were more underweight than overweight orphans. However, another study reported that the prevalence of underweight among children decreased and more of them were in the normal weight range when they grew older (Moy, Gan & Mohd Kassim, 2004).

In this study, there were significant differences in weight status and body fat percentage between children and adolescents. The mean BMI value and body fat percentage of adolescents were higher than those of the children. In addition, results also showed that there were overweight adolescents but no overweight children in this study. The reasons for this include an increase in nutrient requirements during the adolescence stage and the differing influences of food intake between children and adolescents. Lew and Barlow (2005) reported that adolescents are at a greater risk of being obese due to the increase in amount of or change in the type of food consumed. In addition, food intake influences such as negative body image (extreme ideals of slimness), peer or social pressure, busy schedules, exposure to alcohol, drugs, and tobacco and meals eaten away from home are more prone among adolescents compared to children; moreover adolescents also have more freedom in making food choices for themselves (Whitney & Rolfes 2002). The caretaker of the welfare home also reported that adolescents were given more freedom to determine the quantities and type of foods they wanted to consume and were more likely to practice irregular meal patterns without the supervision of the guardians. Further, the quantities of food provided by the kitchen were also different for children and adolescents as more varieties and quantities of foods were provided for adolescents compared to children. Another contributing reason could be the prevalence of breakfast skipping, which increased with increasing age as reported by Moy *et al.* (2004). This unhealthy dietary practice may contribute to over consumption that results in weight gain and increase in body fatness after a prolonged fasting of skipping meals.

In terms of dietary assessment, energy, protein, calcium, iron, and zinc intake was assessed among female children and adolescents in this study. The children met the RNI requirements for all the studied nutrients but adolescents did not meet the RNI requirements for calcium and folate. Protein energy malnutrition (PEM) is one of the key nutritional problems in the world which affects more than 70% of children living in Asia (Lekhraj Rampal & Wong, 2003). However, both children and adolescents in this study were not at risk of protein energy malnutrition (PEM) as they met the RNI requirements for both energy and protein. Children had a higher mean in

energy intake than adolescents with 1.6 times above the RNI requirements but this result was not significant.

A total of 75.3% of adolescents in Malaysia eat at western fast food restaurants (Lew & Barlow, 2005). Hence, the major source of protein among adolescents is from meat-based food products influenced by a western lifestyle. The major source of protein among the subjects in this study was mainly from plant-based food products such as baked-beans and tofu and other food products such as eggs. The higher proportion of plant-based food products available in their diet is due to the reason that the food provided for the children represents donations by wet markets and vegetarian temples.

Besides PEM, micronutrient deficiency is also common among Asian children (Khor, 2003). In this study, the mean dietary intake of calcium and folate among adolescents was below the RNI requirements. High consumption of snacks by the adolescents might influence the dietary intake of calcium and folate in this group. Lew and Barlow (2005) reported that snacks provided approximately one-quarter of an adolescent's daily intake of energy consumed but are usually high in fat and sugar and low in micronutrients such as iron, calcium, vitamins A, C, and folate. In addition, adolescents do have a common practice of choosing soft drinks over milk (Gillis & Williams, 2003). This unhealthy practice not only displaces the nutrients found in milk, but also impairs calcium absorption. The main sources of dietary calcium for both children and adolescents in this study were not dairy products but fish products such as canned sardines and anchovies, bean products such as yellow dhal and various vegetables such as spinach, mustard leaves, *cekur manis*, *kai-lan* and broccoli.

The prevalence of iron deficiency anaemia (IDA) in Malaysia is still moderately high amongst infants, young children and women of childbearing age (Foo *et al*., 2004). Iron is important during childhood and adolescence due to its role in cognitive and immune functions. Besides, adolescents require sufficient amounts of iron to support growth of muscle and lean body mass for boys and to replace iron loss during menstruation for girls (Whitney & Rolfes, 2002). Female girls and adolescents recruited in this study were not at risk of IDA because they met the RNI requirement for dietary iron intake. The various types of iron-containing foods that they consumed include canned sardine, chicken, eggs, anchovies, tofu, iron-fortified chocolate drinks and iron-fortified bread. Among all these foods, tofu and iron-fortified chocolate drinks were their main sources of dietary iron intake. For dietary zinc intake, all children and adolescents met the RNI requirement. However, adolescents of 15 years of age met 20% of the RNI dietary requirement for zinc intake (data not shown). This extremely low level of dietary zinc intake may be due to the low consumption of zinc-rich foods such as seafood, nuts, and poultry that is usually consumed via main meals.

Much of the food in the welfare home was provided by local food banks such as nearby wet markets and vegetarian temples. Thus, variety was always limited for the children and adolescents, which further affects their food consumption and dietary intake of various nutrients (Gillis & Williams, 2003). As a consequence, those who spent a longer time in the welfare home are therefore more likely to refuse eating the foods provided by the kitchens due to poor appetite for similar foods over a prolonged period of time (Gillis & Williams, 2003).

This study has some limitations. As the 24-hour dietary recall used in this study

relies on memory, and if uncertain, subjects may create a new estimation. Hence, in order to minimise this limitation, photos and various measuring tools were used during the 24-hour dietary recall assessment. Besides, there may be some deviation in estimates of portion sizes of various quantities from the actual amount of consumption. Another limitation of this study lies in the skinfold thickness measurement. In order to obtain a consistent and accurate skinfold thickness measurement, a well-trained and experienced anthropometrist is required; our results on skinfold thickness measurement may not therefore be very accurate.

CONCLUSION

Children constitute a country's future. Thus, it is important to ameliorate the nutritional problems among children before it is too late. Over-nutrition among children and adolescents is due to poor dietary and lifestyle habits such as excessive consumption of foods that are high in fat or carbohydrate and a sedentary lifestyle. However, under-nutrition is often associated with poverty, poor appetite due to diseases and limited food choices. Adequate intake of energy and various nutrients and good dietary habits during childhood and adolescence are important to support optimum rapid growth and spurts and also to prevent the onset of diet-related diseases that have a negative impact on later life. Hence it is crucial to solve both under- and over-nutrition problems among children and adolescents that co-exist in the country.

A strategy to combat these nutritional problems is nutrition education. Nutrition education activities such as public forums and educational campaigns should be conducted to create awareness on the importance of proper nutrition. Some of the topics that we should focus on are the importance of diet variety and balanced meals, maintaining a healthy body weight and promotion of healthy eating habits. Nutrition education should be provided to all children and adolescents in the nation especially those living in orphanages and welfare or shelter homes.

Some of the suggestions to improve the nutritional status among female children and adolescents in welfare homes are education on nutrition knowledge and different cooking methods to add variety to their food which may help to improve their appetite and minimise the incidence of skipping meals. Federal and local governments too must extend efforts to help homeless children and adolescents through policy development to ensure a more effective outcome to homelessness (Pauline *et al.*, 2006). In terms of limited food choices, government and related agencies should also help to increase quantity and quality of food availability in poorer sections of society (UNICEF, 2000).

In essence, this study indicates that a possible reason for the inadequate intake of nutrients is improper practice of dietary habits such as skipping main meals, snacking instead of consuming staple foods as their main meals and eating only when they are hungry. Therefore, there is a need to study the dietary habits and nutritional knowledge, attitude and practice among female children and adolescents for a better understanding towards the implementation of effective nutrition programmes and interventions that help to improve food-related behaviours that promote better health in adulthood. Besides, there is also a need to study nutritional knowledge, attitude and practice among the social workers, caretakers and guardians who play an important role in modeling good nutrition practice early in their lives. All such

information should provides a better understanding of the nutritional status among children and adolescents who stay at shelter or welfare homes and pave the way for determining the most effective and suitable nutrition programmes and interventions.

REFERENCES

Aboud F, Samuel M, Hadera A & Addus A (1991). Intellectual, social and nutritional status of children in an Ethiopian orphanage. *Soc Sci Med* 33(11): 1275-80.

CDC (2006). About BMI for Children and Teens: Centers for Diseases Control and Prevention.*http://www.cdc.gov/nccdphpdnpa/bmi/childrens_BMIabout_childrens_BMI.htm#What%20is%20BMI.* Accessed on 20 September 2006.

De Onis M (2000). Measuring nutritional status in relation to mortality. *Bulletin of the World Health Organization* 78 (10): 1271–1274.

De Onis M, Monteiro C, Akre J & Clugston G (1993). The worldwide magnitude of protein-energy malnutrition: an interview from the WHO Global Database on Child Growth. *Bulletin of the World Health Organization* 71(6): 703-712.

Fahey TD, Insel PM & Roth WT (2005) Fit and Well. 6th ed. The McGraw Hill Companies, United States of America.

Foo LH, Khor GL, Tee ES & Prabakaran D (2004). Iron status and dietary iron intake of adolescents from a rural community in Sabah, Malaysia. *Asia Pac J Clin Nutr* 13(1): 48-55.

Gillis DE & Williams PL (2003). Concerns about young women's nutrition: Canadian Family Physician. Available on *http://www.cfpc.ca/cfp/2003/Aug/vol49-aug-clinical-3.asp*. Accessed on 24 March 2007.

Khor GL (2003). Update on the prevalence of malnutrition among children in Asia. *Nepal Med Coll J* 5(2):113-22.

Lekhraj Rampal GR & Wong CH (2003). The nutritional status of Malay children in Kampung Jenderam Hilir, Sepang District, Selangor. *Mal J Public Health Med* 3(2): 14-18.

Lew K & Barlow PJ (2005). Dietary practices of adolescents in Singapore and Malaysia. *Singapore Med J* 46(6): 282-288.

Mora JO, Herrera MG, Sueschun J, de Navarro L & Wagner M (1981). The effects of nutritional supplementation on physical growth of children at risk of malnutrition. *Am J Clin Nutr* 34: 1885–1892.

Moy FM, Gan CY & Mohd Kassim SZ (2004). Body mass status of school children and adolescents in Kuala Lumpur, Malaysia. *Asia Pac J Clin Nutr* 13(4): 324-329.

NCCFN (2005). Recommended Nutrient Intakes for Malaysia, National Coordinating Committee on Food and Nutrition, Ministry of Health Malaysia, Putrajaya

Panpanich R, Brabin B, Gonani A & Graham S (1999). Are orphans at increased risk of malnutrition in Malawi? *Ann Trop Pediatr* 19(3): 279-85.

Pauline A, Williams VH & Lugo N (2006). Homelessness, Deficits in the Diet. *http://www.rnao.org/Page.asp?PageID=122&ContentID=1043&SiteNodeID=327* Accessed on 16 December 2006.

Pon LW, Mirnalini K & Mohd Nasir MT (2004). Body image perception, dietary practices and physical activity of overweight and normal weight Malaysian female adolescents. *Mal J Nutr* 10(2): 131-147.

Sherina MS & Rozali A (2004). Childhood obesity: contributing factors, consequences and intervention. *Mal J Nutr* 10(1): 13-22.

Tee ES, Mohd Ismail N, Mohd Nasir A & Khatijah I (1997). Nutrient Composition of Malaysian Foods, 4th ed

UNICEF (2000). 2000 IDS: Improving Reproductive Health through School-based Interventions among Adolescents in East Java, Indonesia (1996-1999): United Nations Children's Fund. *http://www.unicef.org/evaldatabase/index_19005.html*. Accessed on 15 December 2006.

Whitney E & Rolfes SR (2002). Understanding Nutrition. 9th ed. Thomson Learning, Inc., United States of America