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# NUTRITIONAL ADEQUACY AMONG INHABITANTS OF A LOCAL ORPHANAGE IN KULIM, KEDAH

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## ABSTRACT

Increasing trend of global burden among malnourished children is inevitable and merely occurs among the underprivileged. The study aimed to determine the dietary patterns and nutritional adequacy at an orphanage in Kulim, Kedah. A total of 30 children were selected from the orphanage for this cross sectional study. Data collection was carried out in 3 phases. First, demographic data collection of the participating children. Second, dietary intake assessment through semi-quantitative food frequency questionnaire method and finally, anthropometric measurement of the children. Majority of the children were female (53.33%). The average age of the children was 14 ±2.57 years old. The mean weight and height was 42.34 ± 11.92 kg and 151.07 ± 9.36 cm, respectively. According to the BMI for age, 73.3 % were within normal BMI, 13.3 % were considered thin and the remaining 13.4% were in the severe thin category. The overall mean energy intake was 2,563.57 ± 677.42 kcal. Female children took an average of 2,345.38 ± 647.03 kcal while the male children had a mean of 2,812.93 ± 544.26 kcal. This nutritional assessment showed that only small portion of children were affected and the rest were in their optimal nutritional condition. The assessment must be conducted periodically to ensure they live a healthier life and to prevent further medical and psychosocial implications. Besides that, the home administrator must obtain advice from a qualified nutritionist for the menu served as children being total vegetarian. It will ensure variability of served food and sustainability of its nutritional value.

**Keywords:** Orphanage- children – Kulim – nutritional status – BMI

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## 1.0 Introduction

The global burden of malnourished children is an issue since four consecutive decades and is still common among children living in developing countries. An estimation of 50.6 million children under the age of five are malnourished and those who are severely malnourished and admitted to hospital faced a 30-50% case fatality rate (WHO 2013). The death rate can only be brought down for less than 5% with aggressive treatment and diet monitoring if admission was carried earlier. However, public health evidence base for effective control and prevention is a must to overcome rising of diseases secondary to malnutrition in childhood (Ashworth et al. 2003; WHO 2013).

Malnutrition problem merely occurred among disadvantaged children which are always due to external factors such as poverty. One of the main causes of early child morbidity and mortality in developing countries is malnutrition (Sarker et al. 2005; Watts et al. 2007). Nutritional inadequacy has a serious negative impact on the growth and development of children. Children need adequate nutrient intake to meet their nutritional needs either under parental or non-parental. Malnutrition in all its forms regardless of child's age can have a long term impact on a child's physical and mental development, and in severe cases may lead to death. Therefore, proper nutrition during childhood help prevent nutrition related diseases and the risk of chronic diseases later in adulthood (Serere et al. 2013).

Malnourish is not only for under nutrition. The other category of malnutrition is over nutrition. The trend of over nutrition especially in the form of high intake of fats among children has become one of major concerns these days. Emergence of fast food or junk food which is easily found, cheap and high in fat is related to poor socioeconomic control especially nutritional education (Ajao et al. 2010). It was highly consumed not only in developed countries, but also in certain developing countries; especially in middle income countries.

The need to promote healthy diet since childhood to curb the obesity epidemic has today been recognized by most countries (Watts et al. 2007). In free-living, previously sedentary children, body weight increased with increased dietary fat consumption. Children who consumed more fat, consumed more total energy and had greater body weight at 12 weeks compared to those who consumed lower fat diets and less total energy. High fat diet contributes to weight gain by increasing energy intake and low fat diet can help prevent weight gain by decreasing energy intake. Reduction of fat intake appears to be a viable strategy to prevent weight gain when energy intake is consumed freely without any restrictions (Donnely et al. 2008). Most reported malnutrition among orphans living in institutions run by governmental and non-governmental organizations are protein energy malnutrition (PEM), vitamin A and B -complex deficiencies, iron deficiency anaemia and iodine deficiency disorders (Vaida 2013).

Orphans are different in psychological aspect as this group comprises of a deprived and isolated population. They deserve special attention to become robust citizens physically and mentally. Malnutrition due to depression and withdrawal among orphans in adaptation phase is one of the problems faced by orphanage institutions (Khare et al. 2012). More than 50 years of research provides convincing evidence that the type of institutional care provided in western countries has a detrimental effect on cognition, behavioural, emotional and social development of young children. Nonetheless, in some poverty stricken countries, it has been

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observed that the children in orphanages have better chances of cognitive development, when the children were encouraged to participate along with the staff in the decisions that influenced them in the institutions (Vaida 2013).

The intention of this study was to assess the nutritional adequacy pertaining to food preparations, physical activity of the children and their health status. It is to give a clearer picture of dietary requirement for the children as compared to the recommended nutrient intakes. Therefore, the objective of this study was to determine the dietary pattern and nutritional adequacy of children at the orphanage in Kulim, Kedah.

## 2.0 Materials and Methods

### *2.1 Study area and subjects*

It is a cross sectional study to assess the nutritional status of orphan children from age 10-18 years old in Kulim, Kedah. Data were collected on 25 March 2014. All 30 subjects from age 10 to 18 years old were selected from this institution after fulfilling the inclusion criteria. The participated orphanage home was chosen via convenient sampling based on their availability and readiness to take part in this study.

### *2.2 Data collection*

Data collection was carried out in three phases. First, the socio-demographic data of the participating children were collected. Second, dietary intake assessment was carried out through semi-quantitative food frequency questionnaire method. Both first and second phases of data collection were done by interviewing the children. The dietary intake was fixed according to their pre-scheduled menu. Amount of food consumed in gram per day was calculated by the following formula: Conversion Factor × Serving Size × Total Number of Servings × Weight of Food in Each Serving. (Wessex Institute of Public Health 1995).

The amount of food in grams was further converted into nutrient content. In the third phase of data collection, anthropometric measurements of the children were taken. The weight was recorded in kilograms by using an electronic weighing machine which was calibrated. The children were asked to remove their shoes and to stand in upright position before the measurement was taken. The height of the children recorded in centimeters by using a height measurement scale. Prior to measurement, they were asked to stand upright on a firm level ground and against a flat vertical surface and without any footwear. Other parameters which were computed are BMI for age, weight for age and height for age of the children.

### *2.3 Statistical analysis*

Data analysis was done using 'Statistical Package for Social Sciences' (SPSS) Version 22.0. Independent variables such as age, gender, educational level and illness were recorded. The continuous variables were summarized via descriptive statistics, namely mean and standard deviation, while for categorical variables; they were summarized by frequencies and percentages. Chi-square test and Student's t-test were used to analyze the data. Statistical significance was taken at the p value $< 0.05$.

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### *2.4 Ethical consideration*

The principal and caretakers of the orphanage home were briefed regarding the purpose of the study. They were reassured that the procedures involved in this study were only questionnaires and non-invasive anthropometric measurement. Children who were found to be underweight or overweight were referred to the nearest government health clinic for further check-up.

## 3.0 Result

### *3.1 Characteristics of respondents*

A total of 30 children were approached to become the respondents for this study. The response rate was 100%. Table 1 shows the demographic characteristics of the children. Majority of the children were females (53.33%. n=16). The average age was 14 (±2.57) years old. Eight of them were below the age of 13 (26.7 %) while 73.3 % were above 12 years old. The mean weight and height was 42.34kg (±11.92) and 151.07cm (±9.36) respectively. The Z score distribution in weight for age in female was -0.89 (SD ± 1.46) which showed a wide distribution compared to reference. Similar findings were found in the male group with weight for age of -1.46 (± 1.54). Mean Z score was -0.96 (±1.28) for the corrected height for age and this demonstrates that the distribution had a narrower spread towards the mean.

According to the BMI for age, the Z score distribution was -0.9 (±1.49) that shows some if not all participants were underweight. Upon further sub dividing the group according to the standard deviation, (73.3%. n=22) were within normal BMI, (13.3%. n=4) were considered thin and the remaining of them were in the severe thin category in which they were all males. The overall mean energy intake was 2,563.57 kcal (±677.42) in which the females consumed an average of 2,345.38 kcal (±647.03) while the males has a mean of 2,812.93 kcal (±544.26).

### *3.2 Energy intake of children*

Most of the energy intake was contributed by carbohydrate (51.7%), fat (21.4%), other micronutrients (17.3%), and subsequently protein (9.6%). According to gender, male had a slightly higher intake of protein with 68.14 g/ day (±17.5). The fat intake was seen higher in males with mean difference of 12.58 (p=0.048) compared to females (Table 2). Carbohydrate difference was not significant (p=0.055).

### *3.3 Body fat measurement according to gender*

Both females and males had almost similar resting metabolism, with females 1,083.06 kcal/day (± 214.52) and males 1,060 kcal/day (±181.45) (Table 3). Female, as expected had a slightly higher subcutaneous body fat of 16.98% (±6.18) as compared to males 8.95% (±4.97). However in the proportion of skeletal muscle for the whole body, the males had higher mass with 35.85% (±2.62).

### *3.4 Mean macronutrients according to gender*

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In comparison to the RNI requirement for adolescent, the protein intake for both gender were adequate. However both had excessive fat and carbohydrate intake. The girls took mean fat intake of 101.63 g/day (SD± 32.89) while the boys took about 124.07 g/day (SD±34.4) (Table 4).

**Table 1:** Characteristic of respondents (N=30)

| Variable | Total (%) N=30 | Female (N= 16) Count | (%) | Male (N= 14) Count | (%) |
|---|---|---|---|---|---|
| Age (years) mean(SD) | 14.07 (2.57) | 14.75(2.49) | | 13.29(2.53) | |
| < 13 years old | 8 (26.7) | 1 | (6.2) | 7 | (50.0) |
| 13 -18 years old | 22 (73.3) | 15 | (93.8) | 7 | (50.0) |
| Weight (kg) (mean , SD) | 42.34 (11.92) | 46.38 (13.11) | | 37.73 (8.68) | |
| Height (cm) (mean, SD) | 151.07 (9.36) | 152.19 (9.42) | | 149.79 (9.47) | |
| Weight for Age -Z score (mean, SD) | -1.12 (1.51) | -0.89 (1.46) | | -1.46 (1.54) | |
| Height for Age -Z score (mean, SD) | -0.96 (1.28) | -0.9 (1.43) | | -1.0 (1.13) | |
| BMI for age (Z score) (mean, SD) | -0.9 (1.49) | -0.37 (1.29) | | -1.4(1.57) | |
| < -3 SD | 2 (6.7) | 0 | 0 | 2 | 14.3 |
| < -2 SD | 4 (13.3) | 1 | 6.2 | 3 | 21.4 |
| Normal | 22 (73.3) | 13 | 81.2 | 9 | 64.3 |
| > +1 SD | 2 (6.7) | 2 | 12.5 | 0 | 0 |
| > +2 SD | 0 | 0 | 0 | 0 | 0 |

**Table 2:** Energy and macronutrient intake of children

| Macronutrient | Total (g) Mean(SD) | Female (N= 16) Mean(SD) | Male(N= 14) Mean(SD) | Mean diff [a] | *p* value |
|---|---|---|---|---|---|
| Total energy intake (kcal) | 2563.57(677.42) | 2345.38 (647.03) | 2812.93(544.26) | 467.55 | 0.058 |
| Protein | 61.43 (17.53) | 55.56 (15.80) | 68.14(17.5) | 22.45 | 0.079 |
| Fat | 112.10 (34.92) | 101.63 (32.89) | 124.07(34.4) | 12.58 | 0.048* |
| Carbohydrate | 328.93 (78.31) | 303.44 (76.46) | 358.07 (72.26) | 54.63 | 0.055 |

Statistical test: [a] = Student t-test *Significant values at $p<0.05$

**Table 3:** Body fat measurement according to gender

| Measurement | Total Mean(SD) | Female (N= 16) Mean(SD) | Male(N= 14) Mean(SD) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Resting Metabolism (kcal/day) | 1072.53(196.71) | 1083.06 (214.52) | 1060(181.45) |
| Body Fat (%) | 21.48 (6.9) | 24.61 (5.79) | 17.9(6.52) |
| Subcutaneous Fat Trunk (%) | 13.23 (6.89) | 16.98 (6.18) | 8.95(4.97) |
| Subcutaneous Fat Whole Body (%) | 16.8 (7.05) | 21.14 (6.21) | 11.84(4.07) |
| Skeletal Muscle Whole Body (%) | 31.14 (5.05) | 27.02 (2.14) | 35.85 (2.62) |

**Table 4:** Mean macronutrient intakes in comparison with RNI male and female

| Gender | Macronutrient (g) | Percentage (%) | RNI | Mean (SD) |
|---|---|---|---|---|
| Male | Protein | 9.27 ± 0.37 | 55 g/day | 55.56 ± 15.80 |
| | Fat | 17.17 ± 1.65 | 54-69 g/day | 101.63 ± 32.89 |
| | Carbohydrate | 52.13 ± 3.71 | 130 g/day | 303.44 ± 76.46 |
| Female | Protein | 9.65 ± 0.60 | 63 gm/day | 68.14 ± 17.5 |
| | Fat | 17.48 ± 1.20 | 54-69 gm/day | 124.07 ± 34.4 |
| | Carbohydrate | 51.26 ± 2.80 | 130 g/day | 358.07 ± 72.26 |

## 4.0 Discussion

Adolescents are the future of our nation and their health has always been the centre of attention. WHO (1986) define adolescent as those between age 10 to 19 years old and in the United Nations convention on the rights of child 1989 consider all individuals under the age of 18 years. Transition of adolescent at this period not only effects psychologically but the changes of body function made it interesting and became a challenge in maintaining their health. Our study prioritizes in looking at the vulnerable group of children who are living in a homogenous environment such as the orphanage home and to conduct assessment on their body composition and dietary intake.

As these children came from different age groups and stages in growth development, defining overweight, obese or underweight has been a challenge. Adult cut-off point was based on risk factors for example cardiovascular risk. The rational of using the 85th or 90th centile benchmark was also debatable across the countries with different background. WHO has set a standard of adjusting weight, height and BMI-for-age and these standards were used in our study. WHO Global Database on Child Growth and Malnutrition has used <-2 SD to classify low weight-for-age and low height-for-age as moderate and severe under nutrition, and <-3 SD to define severe under nutrition.

Comparing the weight for age using the Z score showed that there were a small proportion of children living in this orphanage home were affected. A mean score of below zero from the expected value of weight could have shifted the distribution downward. However, in our data, it was also noted that the standard deviation was more than 1.2 SD which implies wide variation of distribution. This could be implicated by the fact that the institution that we studied has a small population and despite taking all the children, the sample size was still small.

There was a similar pattern in the height-for-age, however the distribution was more towards the mean as the SD was less than 1.3. Exploring further did identify a small percentage of males who were rather too thin despite the homogenicity of the food intake and small variations of environment as they live together for at least 6 months in this orphanage home. Using the mean Z score should be the standard in looking at the health and nutritional problems in deciding for intervention (WHO 2005).

According to the total energy intake for both groups, despite the vegetarian food consumption, they have met the requirement for adolescent (RNI Malaysia 2005), but somehow the BMI-for-age was not achieved. Looking further into the proportion of energy contributed by the 3 main groups of food class, namely carbohydrate, fat and protein, as recommended by WHO (1990, 2003) for the prevention of diet-related chronic disease, the intake of total carbohydrate was suggested from 55% to 75% of total energy. The percentage of total protein and fat intake on the other hand are 10-15% and 15-30% respectively. Based on this study, it was evident that despite adequate total energy intake, the proportion was uneven with a lower protein intake in general.

Assessment of percentage body fat showed that both males and females were within normal range, but in males, the subcutaneous fat of the whole body and trunk were slightly lower. These partly explained the shift of BMI for age Z score in our small sample. Despite being the first study done to assess the body composition and nutrient requirement of orphanage children on vegetarian diet, there were other limitations that we had to face. Small sample size rendered the results inaccurate and our next suggestion for further studies to include other centres and perform comparison. In our study, in order to explore the vegetarian diet, we end up taking all Indian ethnicity and this was another limitation.

Future studies should include all races in order to be able to generalize to other orphanage home .We chose one meal in random in order to assess which might not represent the true intake of the children. A 24 hours dietary recall may be more appropriate but the challenge of eliminating recall bias especially in children can be challenging. We would like to propose to the centre a healthier and balanced diet for their children.

## 5.0 Conclusion and recommendation

This nutritional assessment showed that only small portion of children were affected and the rest were in their optimal nutritional condition. The assessment must be conducted periodically to ensure they live a healthier life and to prevent further medical and

psychosocial implications. Besides that, the home administrator must obtain advice from a qualified nutritionist for the menu served as children being total vegetarian. It will ensure variability of served food and sustainability of its nutritional value.

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## Declaration

Author(s) declare that all works are original and this manuscript has not been published in any other journals.

## Authors' contribution

Author 1: Advised during manuscript preparation, idea conceptualizing
Author 2: Idea conceptualizing, literature review, drafting the final manuscript, publication
Author 3: Idea conceptualizing, literature review, data analysis
Author 4: Literature review, literature review, data analysis
Author 5: Literature review, reviewing the final draft

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