*Malaysian Journal of Medicine and Health Sciences Vol. 2(1)January 2006: 11–23*

# Nutritional Status of Primary School Children, Sepang District, Selangor 2004

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## ABSTRACT

**Objectives**: This study was carried out to determine the nutritional status of primary school children aged 6 to 11 years in Sepang District and to compare the results with a similar study carried out in 1999. **Methods:** This cross-sectional study was carried out in Sepang District using stratified random cluster sampling technique. A pre-tested, structured questionnaire was used to collect the data. Weight was recorded using a digital bathroom scale TANITA model HD-309 and height was measured by using a SECA Body meter Model 208. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. Classifications of the nutritional status of respondents was based on WHO classification 1983 and 1995. Data were analysed using SPSS. **Results:** The overall mean BMI for the 1,910 respondents was 16.8 (95% CI= 16.67 – 16.99; SE=0.08). The median BMI was 15.7 ranging from 9.51 to 36.75 kg/m$^2$. The majority (84.4%) had normal weight-for-age status, 7.6% respondents had weight-for-age status below –2 SD of the NCHS-WHO median and 8.0% had weight-for-age status above +2 SD of the NCHS-WHO median. The prevalence of underweight and overweight was significantly higher in the males compared to the females ($p< 0.05$). There was a significant association between underweight and ethnicity ($p< 0.05$). The majority (90.3%) had normal height-for-age status, 8.8% had height-for-age below –2 SD of the NCHS-WHO standard median and 0.9% had height-for-age above 2 SD from the NCHS median. The prevalence of stunting was significantly higher in the male (10.3%) as compared to 7.4% in the females ($\chi^2 = 5.11$, $p = 0.02$). The majority (81.4%) of the respondents were within the normal weight-for-height, 3.4% were wasted (weight-for-height was below –2 SD of the NCHS-WHO median) and 15.2% of the respondents were obese (weight-for-height that is more than +2 SD of the NCHS-WHO median). The prevalence of wasting was higher in the females (4.1%) compared to males (2.8%). The prevalence of obesity was slightly higher in the males (15.4%) compared to females (14.9%). **Conclusion:** The overall nutritional status of primary schools children is good. However, there still exists pockets of population in Sepang where chronic and acute forms of undernutrition persist in these children.

**Keywords: Nutritional status, primary school children, Sepang District, Selangor**

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## INTRODUCTION

Nutritional status is the result of a complex interaction between the food we eat, our overall state of health, and the environment in which we live. Malnutrition affects close to 800 million people (20% of all people) in the developing world and is "the silent emergency" which is an accomplice in at least half of the 10.4 million child deaths each year. [1]

Paradoxically coexisting with undernutrition, an escalating global epidemic of overweight and obesity – "globesity" – is taking over many parts of the world. If immediate action is not taken, millions will suffer from an array of serious health disorders. As of 2000, the number of obese adults was over 300 million. The obesity epidemic is not restricted to industrialised societies; in developing countries, it is estimated that over 115 million people suffer from obesity-related problems .[2] Socio-economic advancement and modernisation have brought about significant changes in the lifestyle of communities resulting in an increased trend of overweight and obesity. Reilly *et al* [3] reported that even by the age of 5, the prevalence of obesity among British children was higher than that expected from the national standards and that this persisted into the teenage years. Obesity in children has a profound influence on morbidity and mortality of adult life. [4,5,6]

The growth of the children is the best indicator of their well-being. Usually, malnutrition in children is the consequence of several factors including poor food quality, insufficient food intake, and severe and repeated infectious diseases or a combination of these factors. Growth retardation in early childhood is associated with significant functional impairment in adult life and reduced work capacity. Thus, it affects economic productivity.[7] Even though Malaysia has sustained rapid and marked socio-economic advancements for the past two decades, the problems of protein-energy malnutrition in the form of underweight, stunting and wasting still persists.[8] It is more serious in the rural areas. Poor growth is associated with delayed mental development and there is a relationship between impaired growth status and poor school performance and reduced intellectual achievement. As children are the future resources of the country, they should have the opportunities for the fullest development and growth towards maturity through physical, socio-emotional and spiritual well-being. There is a correlation between nutritional status of children and socio-economic factors such as low educational level, number of children in the family, mother's nutritional knowledge, and faulty feeding in the weaning and post-weaning period. [9, 10] Anthropometric data can give us the information on both the past and present nutritional, ecological and overall development status of the community under investigation.[11] The aim of this study was to determine the nutritional status of school children aged 6-11 years in 2004 and compare the results with those in 1999 in Sepang District; and to determine the relationship between nutritional status and age, sex and ethnicity.

## MATERIALS AND METHODS

A cross-sectional study design with multistage stratified random cluster sampling technique was carried out in Sepang District, Selangor. The sampling frame was a list of all the 38 primary schools in Sepang District. First, the schools were stratified into national primary, national type (Chinese) primary, national type (Tamil) primary and national (Orang Asli)

primary schools. Then, 3 national primary, 2 national type (Chinese) primary, 2 national type (Tamil) primary and 2 national (Orang Asli) primary schools were selected. The schools in each category were selected using the table of random numbers. Thus, a total of nine schools out of the 38 primary schools in Sepang District were selected. The sample population consisted of students from the nine selected schools. The sample units were all students aged between 6-11 years in the nine selected schools. A standardised format was used to collect the data on age, sex, ethnicity, weight and height. Age was computed by comparing date of interview to the date of birth stated in the Birth Registration Certificate. Weight was recorded using the digital bathroom scale TANITA model HD-306. This digital bathroom scale has scales marked in kilogram and measures weight to the nearest 0.1-kilogram. This device was reset to read zero every time before measurement was taken. After the reading reached zero, the child was asked to stand with bare feet on the middle of the weighing machine, with the head looking straight to the front, arms hung loose on the sides and with minimal clothing (light shorts and shirt for boys without wearing songkok or cap, and light dresses for girls without hair band). When the reading of the weighing machine was stable, the weight was recorded.

Height was measured using SECA Body Meter Model 208 (made in Hamburg). The accuracy of this device is up to 0.05 centimeter. Height was measured by suspending the SECA Body Meter 2 meters high from the floor against a straight wall, parallel to either a doorframe or pillar. The child was then requested to stand barefoot under the center of the measuring tongue of the body meter without cap or songkok and then to lean against the wall with the back and head looking straight ahead so that an imaginary plane that would connect the eyes and ears was parallel to the floor. The child's heel was made to rest together against the wall or pillar, and the hands hung loose on the sides. The measuring tongue was lowered towards the head until it gently touched the head. Height measurement appearing in the read-off area was then recorded. Data were analysed by using Statistical Package of Social Sciences (SPSS) version 10. Age, weight and height measurements were used to form the three indicators of nutritional status: weight-for-age, height-for-age, weight-for-height. These indicators were compared with the international reference population collected by the United States National Center for Health Statistics (NCHS).

Classification of nutritional status was based on the World Health Organisation (WHO) guidelines as follows:

WHO (1983)[12]

| | | |
|---|---|---|
| *Underweight* | : | weight-for-age below minus 2 SD of the NCHS median |
| *Stunted* | : | height-for-age below minus 2 SD of the NCHS median |
| *Wasted* | : | weight-for-height below minus 2 SD from the NCHS median |
| *Overweight* | : | weight-for-age or weight-for-height above plus 2 SD of the NCHS median |

WHO (1995)[13]

| | | |
|---|---|---|
| *Tallness* | : | height-for-age above plus 2 SD of the NCHS median |
| *Wasted* | : | BMI below 5$^{th}$ percentile of BMI-for-age for boys with height of more than 145 cm and for girls with height of more than 137 cm |

*Overweight* : BMI of more than 85th percentile of BMI-for-age for boys with height of more than 145cm and for girls with height of more than 137cm.

Weight-for-age, height-for-age and weight-for-height that were between minus 2 SD and plus 2 SD of the NCHS median or between 5th and 85th percentile of the BMI-for-age were considered as normal growth attainment. Chi-square test was used to determine the relationship between two nominal variables or between one nominal and another dichotomous. The t-test was used to compare the means of two continuous variables. The level of significance used for the above data was $p < 0.05$. When the expected frequency was less than 5 in more than 20 % of the cells, Fisher's exact test was used instead of Chi-square test.

## RESULTS

### *Response Rate*

Of the 2,127 school children aged 6–11 years old enrolled in the nine selected schools, 1,936 were examined, giving a response rate of 91%. Of the total 1,936 students examined, 1,910 were included, giving a final response rate of 89.8%. Twenty-six pupils were excluded because of the absence of required information (date of birth).

### *Characteristics of Respondents*

Of the 1910 respondents, 977 (51.2%) were male. The overall mean age was 8.6 (SE 0.33) years and the median was 8.6 years. The ages ranged from 6.2 to 11.8 years. The majority of the respondents were Malays (51.2%) followed by Chinese (17.7%) and Indians (14.1%). There were 8.3% Orang Asli.

### *Nutritional Status*

#### *BMI*

The overall mean BMI for the 1910 respondents was 16.8 kg/m$^2$ (95% CI= 16.67 – 16.99 kg/m$^2$; SE=0.08). The median was 15.7 kg/m$^2$ and ranged from 9.51 to 36.75 kg/m$^2$. However, the mean BMI for the males (n= 977, BMI=16.9 kg/m$^2$) did not differ significantly from the females (n= 933, BMI=16.8 kg/m$^2$; t=0.6333,df = 1908 and p = 0.53).

**Table 1:** Characteristics of respondents(n=1910)

| | Frequency | Percent |
|---|---|---|
| **Sex** | | |
| Male | 977 | 51.2 |
| Female | 933 | 48.8 |
| Total | 1910 | 100.0 |
| **Age** | | |
| 6.0– 6.99 | 325 | 17.0 |
| 7.0 – 7.99 | 387 | 20.3 |
| 8.0 – 8.99 | 385 | 20.1 |
| 9.0 – 9.99 | 366 | 19.2 |
| 10.0 – 10.99 | 374 | 19.6 |
| 11.0 – 11.99 | 73 | 3.8 |
| Total | 1910 | 100.0 |
| **Ethnicity** | | |
| Malay | 1060 | 55.5 |
| Chinese | 339 | 17.7 |
| Indian | 269 | 14.1 |
| Orang Asli | 159 | 8.3 |
| East Malaysians | 36 | 1.9 |
| Others | 47 | 2.5 |
| Total | 1910 | 100.0 |

***Weight-for-Age Status***

Table 2 shows the nutritional status by weight-for-age by sex, age, and ethnicity. The results show that the majority (84.4%) of the 1,910 respondents had normal weight-for-age status. There were only 7.6% respondents who were underweight, i.e. having weight-for-age status below –2 SD of the NCHS-WHO standard median. The prevalence of overweight was 8.0% i.e. having weight-for-age status above +2 SD of the NCHS-WHO standard median. The prevalence of underweight was significantly higher in the males (9.2%) compared to 5.9% in the females ($\chi^2 = 8.1$, $p = 0.003$). The prevalence of overweight was also significantly higher in the males (9.4%) compared to 6.5% in the females ($\chi^2 = 6.54$, $p = 0.01$). Orang Asli (20.1%) had the highest prevalence of underweight followed by Malays (7.7%), Indians (7.4%), and Chinese (0.9%). The difference in the prevalence of underweight between Malays and Chinese, Indian and Chinese, Orang Asli and Chinese, Orang Asli and Malays and Orang Asli and Indians was statistically significant ($p< 0.05$). However, the difference in the prevalence of underweight between Malays and Indians was not statistically significant ($p=0.75$). The prevalence of overweight was highest among Chinese (15.6%) followed by the East Malaysians (11.1%), Malays (7.1%), Others (6.4%), Orang Asli (5.0%) and Indians (3.7%). The difference in the prevalence of overweight between Malays and Chinese, Malays and Indian, Chinese and Indian was statistically significant ($p< 0.05$).

**Table 2.** Nutritional status by weight-for-age by sex, age, and ethnicity

| Sex/Age/ Ethnicity | n | Nutritional Status | | |
|---|---|---|---|---|
| | | Underweight (%) | Normal (%) | Overweight (%) |
| **Sex** | | | | |
| Male | 977 | 9.2 | 81.4 | 9.4 |
| Female | 933 | 5.9 | 87.6 | 6.5 |
| **Age** | | | | |
| 6.0 – 6.99 | 325 | 10.5 | 82.1 | 7.4 |
| 7.0 – 7.99 | 387 | 8.8 | 84.0 | 7.2 |
| 8.0 – 8.99 | 385 | 8.1 | 80.5 | 11.4 |
| 9.0 – 9.99 | 366 | 6.3 | 86.9 | 6.8 |
| 10.0 – 10.99 | 374 | 4.5 | 87.7 | 7.8 |
| 11.0 – 11.99 | 73 | 8.2 | 87.7 | 4.1 |
| **Ethnicity** | | | | |
| Malay | 1060 | 7.7 | 85.2 | 7.1 |
| Chinese | 339 | 0.9 | 83.5 | 15.6 |
| Indian | 269 | 7.4 | 88.9 | 3.7 |
| Orang asli | 159 | 20.1 | 74.8 | 5.1 |
| East Malaysians | 36 | 11.1 | 77.8 | 11.1 |
| Others | 47 | 8.5 | 85.1 | 6.4 |
| **Total** | 1910 | 7.6 | 84.4 | 8.0 |

### *Height-for-Age Status*

Table 3 shows the nutritional status by height-for-age by sex, age, and ethnicity. Overall, the majority (90.3%) of the respondents in this study had normal height-for-age status ( between –2 SD and +2 SD of the NCHS-WHO median), 8.8% were stunted (height-for-age below –2 SD of the NCHS-WHO standard median) and 0.9% were tall (height-for-age above 2 SD from the NCHS median). The prevalence of stunting was significantly higher in the males (10.3%) compared to 7.4% in the females ($\chi^2 = 5.11$, $p = 0.02$).

School children in the 11-year-old age group were found to have the highest percentage of stunting (13.7%). The prevalence of stunting in the age groups 6–11 ranged from 6.6% to 13.7%. The prevalence of stunting was highest among the Orang Asli children (27.7%) followed by the East Malaysians (16.7%), Others (10.6%), Malays (9.3%), Indians (3.3%) and the Chinese (1.8%). The difference between Orang Asli versus Malay ($\chi^2 = 44.5$, df =1, $p<0.001$ ), Orang Asli versus Chinese ($\chi^2 = 78.1$, df =1, $p<0.001$), Orang Asli versus Indian ($\chi^2$

= 54, df =1, p<0.001 ) was statistically significant. The results show that there was significant association between stunting and ethnicity ($\chi^2$ = 120.372, df = 10, p<0.05).

**Table 3.** Nutritional status by height-for-age by sex, age, and ethnicity.

| Sex/Age/ Ethnicity | n | Nutritional Status | | |
|---|---|---|---|---|
| | | Stunted (%) | Normal (%) | Tall (%) |
| **Sex** | | | | |
| Male | 977 | 10.2 | 88.4 | 1.4 |
| Female | 933 | 7.4 | 92.3 | 0.3 |
| **Age** | | | | |
| 6.0 – 6.99 | 325 | 8.9 | 89.9 | 1.2 |
| 7.0 – 7.99 | 387 | 10.1 | 89.4 | 0.5 |
| 8.0 – 8.99 | 385 | 8.6 | 90.1 | 1.3 |
| 9.0 – 9.99 | 366 | 6.6 | 92.6 | 0.8 |
| 10.0 – 10.99 | 374 | 9.1 | 90.1 | 0.8 |
| 11.0 – 11.99 | 73 | 13.7 | 86.3 | 0 |
| **Ethnicity** | | | | |
| Malay | 1060 | 9.3 | 90.2 | 0.5 |
| Chinese | 339 | 1.8 | 95.6 | 2.6 |
| Indian | 269 | 3.3 | 96.0 | 0.7 |
| Orang asli | 159 | 27.7 | 72.3 | 0 |
| East Malaysians | 36 | 16.7 | 80.5 | 2.8 |
| Others | 47 | 10.6 | 89.4 | 0 |
| **Total** | 1910 | 8.8 | 90.3 | 0.9 |

### *Weight-for-Height Status*

Table 4 shows that the majority (81.4%) of the respondents were within the normal weight-for-height, 3.4% were wasted (weight-for-height was below –2 SD of the NCHS-WHO median) and 15.2% of the respondents were overweight (weight-for-height that was more than +2 SD of the NCHS-WHO median). The prevalence of wasting was higher in the females (4.2%) as compared to males (2.7%). Nevertheless, both sexes exhibited a fairly equal percentage of being obese and also within the normal range, with the difference of less than 1.0% among the sexes (15.6% for males and 14.9% for females). There was a higher incidence of wasting among the 9-year-olds compared to the other age groups, topping it at 4.4%. Meanwhile, the percentage of obese school children was highest amongst the 10-year-olds at 19.3% followed by the 11-year age group (19.2%).

**Table 4.** Nutritional status by weight-for-height by sex, age and ethnicity

| Sex/Age/ Ethnicity | n | Nutritional Status | | |
|---|---|---|---|---|
| | | Wasted (%) | Normal (%) | Overweight (%) |
| **Sex** | | | | |
| Male | 977 | 2.7 | 81.7 | 15.6 |
| Female | 933 | 4.2 | 80.9 | 14.9 |
| **Age** | | | | |
| 6.0 – 6.99 | 325 | 3.1 | 87.1 | 9.8 |
| 7.0 – 7.99 | 387 | 3.1 | 85.0 | 11.9 |
| 8.0 – 8.99 | 385 | 2.9 | 79.2 | 17.9 |
| 9.0 – 9.99 | 366 | 4.4 | 79.8 | 15.8 |
| 10.0 – 10.99 | 374 | 4.0 | 76.7 | 19.3 |
| 11.0 – 11.99 | 73 | 1.4 | 79.4 | 19.2 |
| **Ethnicity** | | | | |
| Malay | 1060 | 2.6 | 81.2 | 16.2 |
| Chinese | 339 | 2.1 | 79.1 | 18.8 |
| Indian | 269 | 9.3 | 80.7 | 10.2 |
| Orang asli | 159 | 1.9 | 89.9 | 8.2 |
| East Malaysians | 36 | 0 | 83.3 | 16.7 |
| Others | 47 | 4.3 | 74.5 | 21.2 |
| **Total** | 1910 | 3.4 | 81.4 | 15.2 |

## DISCUSSION

The persistence of malnutrition with the emergence of over nutrition in a population indicates that the population is undergoing a transitional phase of development. The results of this study show that Sepang district appears to be in the transitional phase from a rural area to a developed area, which is probably due to the influence of the rapid development of KLIA, MSC, Putrajaya, and Cyberjaya. This transitional process is also evident from the construction of new roads, highways and new housing areas in this district. Weight-for-age generally reflects the current nutritional status of children.

This study shows that the nutritional status of primary school children is higher than the results reported in 1999.[14] In this study the prevalence of underweight among the primary school children in Sepang in 2004 was 7.6% which is lower than the prevalence of 10.9% in the same district reported by Husbani in 1999. [14] The present study also shows that males had a significantly higher (9.2%) prevalence of underweight than females (5.9%). Khor and Tee [15] have also reported a higher prevalence rate among males. They reported that this difference could be due to factors such as higher levels of physical activity and inadequate or improper dietary intake in males. The Orang Asli had the highest proportion (20.1%) of underweight. This finding concurred with the findings of a study carried out by

Husbani [14] in Sepang five years ago. However, the prevalence among the Indians is lower to a greater extent than among the Malays. The causes of underweight among the Orang Asli community could possibly be partly due to upper respiratory tract infections and acute diarrhoeal illnesses in children which are much more common in the Orang Asli population than the other ethnic groups. [16] The nutritional status of Indian primary school children in 2004 was higher than in 1999, and this may be due to improved economic conditions resulting from the increase in estate workers' wages and leaving the estate sector to work in mega projects such as the construction of the KLIA airport and others in the area. Low height-for-age indicates "long term, cumulative inadequacies of health or nutrition.[17]

The majority of primary school children in Sepang had normal height-for-age. This study shows that overall, the majority had normal height-for-age (males = 88.3% and females = 92.3%). However, 8.8% of the total respondents were stunted compared to 10.6% in 1999. The prevalence of stunting in 2004 in males (10.3%) was lower compared to 14.9% in 1999 in the same district. Similarly, the prevalence of stunting in 2004 for females (7.43%) was lower compared to 10.1% in 1999. The higher prevalence of stunting in males in 1999 could be attributed to several factors. Among the suggested reasons are delayed pubertal growth spurt,[18,19] higher levels of physical activity, difference in food intake, and greater susceptibility towards infection.[20] Also, the lower prevalence of stunted girls may be due to girls attaining puberty and showing a growth spurt at about 10-11 years. [15]

The results of the present study indicate that the prevalence of wasting among the primary school children in Sepang district was lower in 2004 (3.5%) as compared to 1999 (5.6%). The prevalence of wasting in 2004 in males (2.8%) was lower when compared to 4.9% in 1999 in the same district. Similarly, the prevalence of wasting in 2004 for females (4.1%) was lower when compared to 6.4% in 1999.

The prevalence of overweight and obesity amongst the primary school children in Sepang in 2004 (8.0% and 15.2%) was higher than in 1999 (4% and 9.5%). This difference in the prevalence of overweight and obesity is noted in both the sexes. In 2004, the prevalence of overweight and obesity among males was 9.4% and 15.4% respectively as compared to 6.5% and 14.9% for females in 1999. Overall in 2004, there was a significantly higher prevalence rate of obesity in 10- and 11-year-olds (19.3% and 19.2% ). Overweight and obesity place children and adolescents at increased risk of significant health problems, both during their early life and during adult life. [21-23] Obesity, an emerging major public health problem throughout the world, occurs during one of four critical periods: infancy, early childhood, adolescence, and adulthood. [24] In high-income countries, extensive evidence indicates that obesity during childhood is related to adult obesity. [25,26,27,28,29,30,31,32,33,34]

Epidemiologic literature shows that about one-third of obese preschool children and about one-half of obese school-age children become obese adults,[31] but other studies showed that although fatter children are at elevated risk of becoming obese adults, the prediction of adult obesity from childhood and adolescent adiposity measures is only moderate.[32] The literature suggests that a series of biological factors, such as the timing of adiposity rebound and parental obesity, which might relate to both behavioral and biological causal mechanisms, affect carryover of fatness from childhood into adulthood.[26, 30,31,32,33, 34] There are long-term health risks in terms of chronic disease in adulthood, including

cardiovascular disease; type 2 (non-insulin dependent) diabetes, which is already now being seen in obese children,[35,36,37]osteoarthritis; breast and gastrointestinal cancers; skin disorders; aggravation of rheumatic diseases and asthma and other respiratory diseases.[38]

## CONCLUSION AND RECOMMENDATIONS

There is an improvement in the nutritional status of primary school children in Sepang district compared to five years ago. However, there still exists pockets of population in Sepang where chronic and acute forms of undernutrition persists. The prevalence of overweight and obesity is increasing alarmingly. It is recommended that a comprehensive nutritional educational community based programme be carried out by the Sepang District. Government agencies such as District Office, Health and education departments, along with the involvement of the Parent Teachers Association (PTA).

## ACKNOWLEDGEMENTS

Our thanks are due to Professor Dr Azhar bin Mohd Zain, Dean, Faculty of Medicine and Health Sciences, UniversitiPutra Malaysia for granting permission to publish this paper. We would also like to acknowledge our thanks to Ministry of Education, Malaysia and the Selangor State Education Department, Headmasters, Headmistresses and their staff for permission to undertake the study and their assistance and cooperation. Our gratitude to Prof. Dr Khor Geok Lin for her guidance is also acknowledged.

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