

Original Article

Body mass status of school children and adolescents in Kuala Lumpur, Malaysia

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Lifestyle and disease patterns in Malaysia have changed following rapid economic development. It is important to find out how these changes have affected the nutritional status and health behaviour of the population, especially school children and adolescents. Therefore a survey on school children's and adolescents' health behaviours and perception in Kuala Lumpur was initiated. This paper only reports the observed body mass status of the school children. A total of 3620 school children were selected in this survey using the method of multi-stage sampling. The students were surveyed using pre-tested questionnaires while weight and height were measured by the research team in the field. Using the cut-off of BMI-for-age $\geq 95^{\text{th}}$ percentile and $<5^{\text{th}}$ percentile for overweight and underweight respectively, there were a total of 7.3% of overweight students and 14.8% of underweight students. When analysed by gender, 7.5% of boys and 7.1% girls were overweight, while 16.2% of the boys and 13.3% of the girls were underweight. The youngest age group (11 years old) had the highest prevalence of underweight as well as overweight. With increasing age, the prevalence of underweight and overweight decreased and more children were in the normal weight range. The overall prevalence of overweight among the three ethnic groups was similar. However the prevalence of underweight was highest among the Indian students (24.9%), followed by Malays (18.9%) and Chinese (9.5%) ($P < 0.001$). The results showed that both the problems of under- and over-nutrition co-exist in the capital city of Malaysia. The promotion of healthy eating and physical activities is required to address the problems of under- and over-nutrition in order to build up a strong and healthy nation in the future.

Key Words: body mass status, school children, BMI-for-age, overweight, underweight, Kuala Lumpur, Malaysia

Introduction

In the last decade, there has been very rapid economic and industrial development in Malaysia and living standards have risen to those of developed countries in many areas. This is particularly true in the case of Kuala Lumpur, Malaysia's capital city. With rapid socio-economic development, lifestyle changes and problems related to physical, behavioural and mental health, become common. Malaysia has a large proportion of young people and school-age children (5-20 years) which constitute about 20 percent of its total population.¹ With such a large proportion of young people, it becomes important to know how economic development has affected their lifestyles and health behaviours. For example, exposure to mass media coupled with economic affluence could well influence the attitudes, social activities, physical activities and food habits of school aged children.² The body mass status data presented in this article are part of the findings of a larger survey conducted to gain insight into the health behaviours and perceptions of adolescents in the schools of Kuala Lumpur. Three groups of school children were surveyed, they were in Standard 5 (estimated average age 11 years), Form 2 (estimated average age 14 years) and Form 4 (estimated average age 16 years).

Materials & Methods

Formal permission to conduct the survey was obtained from the Ministry of Education of Malaysia. Participation by the school children was voluntary and the self-administered questionnaires were answered anonymously where the children were not required to write their names in the questionnaires. Teachers were asked to leave the classrooms and not allowed to distribute or collect the questionnaires to ensure confidentiality, anonymity and absence of intimidation. This process was conducted by the research team members and the questionnaires were taken back to the research office as soon as the survey in the schools completed.

Sampling method

The students were selected using the method of multi-stage sampling.³ All schools in Kuala Lumpur (both government and private) were listed. There were a total of 17 private schools and 212 government schools (figures from the

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Ministry of Education). These private schools in general, catered for children from higher socio-economic background and were not included in the sampling frame. Schools for the handicapped were also excluded. All government funded schools (153 primary and 59 secondary) scattered in all the six administrative zones of Kuala Lumpur were included in the sampling frame. In order to obtain a sample of school children reflecting as close as possible the population characteristics of Kuala Lumpur, three major factors were taken into consideration in sampling: gender, ethnicity and socio-economic status.

As the number of primary and secondary schools differed, primary and secondary schools were sampled separately, but in a similar way. Schools were stratified into 'Malay', 'Chinese' and 'Indian' schools based on the majority of children of that ethnicity in the school. The locations of the schools in each zone were noted and stratified into those in "higher income areas" and "lower income areas". To ensure that boys and girls were included in almost equal proportions, schools of each gender were selected in equal proportions. Coeducational schools were also selected on the assumption that boys and girls were in equal proportions. Schools in higher income and lower income areas were selected in approximately equal numbers from each zone. Schools of each ethnicity were also selected to reflect the ethnic proportions of Malaysia.

Sample size estimation

The programme Epi Info 6 was used to estimate sample size for the population survey. Estimating that the prevalence of obesity to be 10% in the population and with an allowance of a 5% precision of the estimate and a confidence level set at 95%, the total sample sizes required for all 3 ethnic groups together for Standard 5 was estimated to be 1240 taking into consideration the ethnic proportions in the country. Using the same method, the sample size required for Form 2 and Form 4 were calculated at 1070 each. It was estimated that a total of 3380 school students would be required for the survey.

Data collection

A self-administered questionnaire was designed to collect the data. The national language (Malay) was used. The questionnaire was pre-tested among some school children in the various grades in the adjacent towns of Petaling Jaya and Kajang. To ensure that the questionnaires were well completed, the investigators were present in the class and read the questions aloud in sequence so that the

questions were fully understood and any queries could be answered. For Indian and Chinese schools, the questions were also translated aloud.

The weights of the students without shoes were taken using a bathroom scale while heights were measured using a microtoise. The weighing scale was calibrated daily with standard weight before the trips to the schools. Trained field workers took both the measurements of weight and height.

In this study, BMI-for age (Body Mass Index) was used as the anthropometric indicator for the nutritional status of the students. The values of BMI-for-age used were based on the reference data of the WHO report.⁴ A child was considered underweight or having low BMI-for-age when his BMI-for-age was <5th percentile and overweight when his BMI-for-age was \geq 95th percentile.

Statistical analysis

All the variables were coded and entered into SPSS for Windows version 10.0. Appropriate statistical analyses were performed using the same software. The significant level was preset at 0.05. Chi-square test for categorical data was used in the analysis.

Results

Demographic characteristics

A total of 3620 students from 29 schools from all 6 administrative zones of Kuala Lumpur responded with only 13 students declining to participate. Of the 3620 respondents, there were 1871 (51.7%) Malays, 1244 (34.4%) Chinese, 441 (12.2%) Indians and a small group of 64 (1.8%) were of other ethnic groups. Only the three main ethnic groups in Peninsula Malaysia totalling 3556 students were included in the analysis as the numbers in minority groups were too small for comparisons to be made. The sample was reflective of the demographic characteristics of Peninsular Malaysia in terms of ethnic distribution and gender proportions. Table 1 shows the distribution of respondents by ethnic group, age groups (indicated by the level of education) and gender.

The students had come from a range of socio-economic backgrounds (as indicated by their fathers' occupations⁵) as shown in Figure 1. Most of the younger students had professional fathers compared to the older age groups. This reflects the recent development of Kuala Lumpur city. The majority of students (43.7%) came from families with 4 or 5 siblings, approximately 20.8% had more than 5 siblings in the family, and 35.5% had 3 or fewer siblings.

Table 1. Number of respondents by ethnicity, gender and age group

Class	Malay		Chinese		Indian		Others		Total
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	
Std 5	308	279	294	235	113	78	6	7	1320
Form 2	322	368	182	170	58	69	10	15	1194
Form 4	276	318	205	158	62	61	14	12	1106
Total	906	965	681	563	233	208	30	34	3620

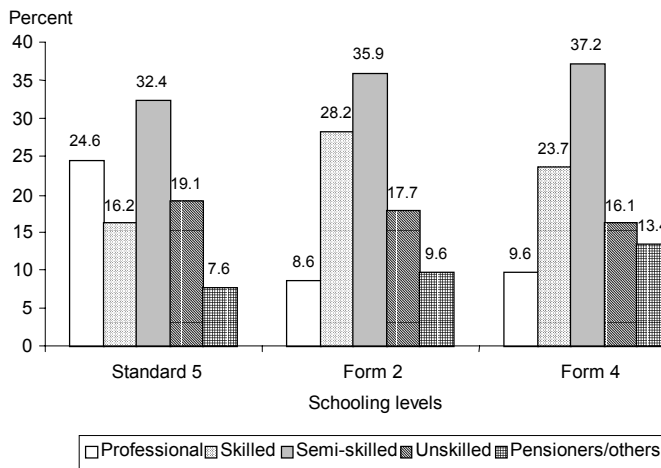


Figure 1. Fathers' occupations by students' schooling level

Body mass status

Based on the cut-offs of < 5th and ≥ 95th percentile of the BMI-for-age, it was found that the problems of underweight and overweight appeared side by side among the children. A total of 7.3% of the students were overweight and 14.8% were underweight. When analysed by gender; 7.5% of the boys and 7.1% of the girls were overweight, while 16.2% of boys and 13.3% girls were underweight. The youngest age group (Standard 5) had the highest prevalence of underweight (16.1%) as well as overweight (10.1%). As the children's age increased, the prevalence

Table 2. Students' body mass status by schooling levels

	Underweight N (%)	Normal weight N (%)	Overweight N (%)
Std 5	221(16.1)	964 (73.8)	132 (10.1)
Form 2	176 (15.1)	927 (79.3)	66 (5.6)
Form 4	138 (12.8)	880 (81.5)	62 (5.7)
Total	535 (14.8)	2771 (77.9)	260 (7.3)

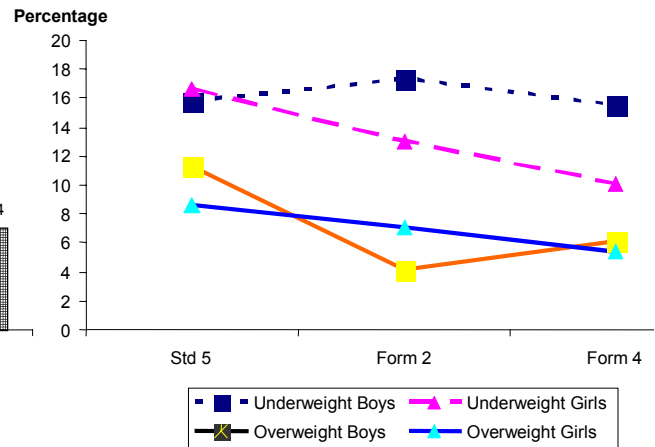


Figure 2. Body mass status of students by gender and schooling levels

of underweight and overweight decreased and more of them were in the normal weight range (Table 2). When the students' weight status was further analysed according to gender, there were about similar proportions of Standard 5 (age 11 years) boys and girls who were underweight, but more boys were overweight. There was a descending trend in this prevalence as their age increased. However, fewer girls were over- and under-weight. At Form 4 (16 years), the boys and girls had similar prevalences of overweight, but there were still more underweight boys as compared to girls at that age (Fig. 2).

The overall prevalence of overweight among the three ethnic groups was similar: 7.8% for the Malay students, 6.7% and 7.0% for the Chinese and Indian students respectively. However the overall prevalence of underweight was highest among the Indian students (21.1%), followed by Malays (15.9%) and Chinese (10.9%); and the difference observed was statistically significant ($P < 0.001$). When these rates were further analysed by gender, it was found that the prevalence of overweight for the boys was 7.6% among Malays, 7.6% among Chinese and 6.9% among Indians; while for the females it was

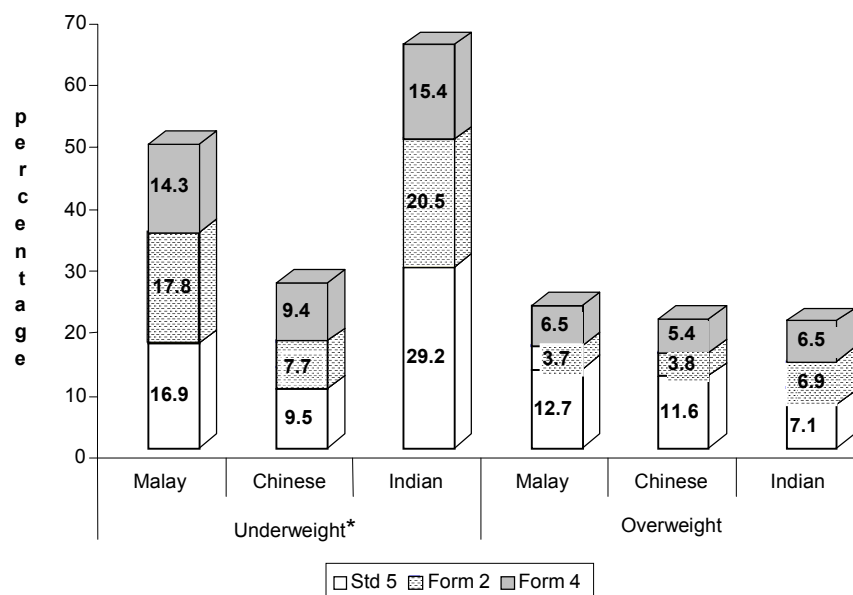


Figure 3. Body mass status of boys by ethnicity and schooling levels * denotes statistical significance among races ($P < 0.001$)

8.0% among Malays, 5.5% among Chinese and 7.2% among Indians. There were no outstanding differences among the three ethnic groups. On the other hand, the overall prevalence of underweight among boys was 18.9% among Malays, 9.5% among the Chinese and 24.9% among Indians. The overall prevalence of underweight among girls was 13.1% among Malays, 12.4% among Chinese and 24.9% among Indians. Indians had the highest prevalence of underweight among both boys and girls, however this difference was only statistically significant ($P < 0.001$) among the boys.

Analysis of the rates of underweight and overweight by race, gender and schooling levels was also carried out. It was found that the Indian boys had the highest prevalence of underweight in all age groups while there was no consistent trend in the prevalence of overweight among the boys of all age groups (Fig. 3). The Malay girls

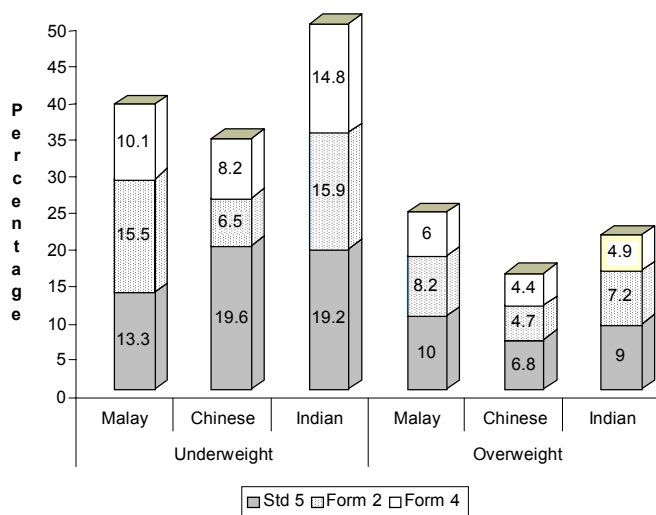


Figure 4. Body mass status of girls by ethnicity and schooling levels

had the highest prevalence of overweight and the Chinese girls had the lowest prevalence of overweight in all age groups while the Indian girls had the highest prevalence of underweight in Forms 2 and 4 (Fig. 4).

Discussion

Rapid socio-economic development is associated with changes in the lifestyle of the community especially those from the urban areas.⁶ These include changes in physical activities and food consumption patterns.^{6,7} Kuala Lumpur as the capital city of the country is well developed, however the influx of migrants from the rural areas seeking employment opportunities has created areas of squatters in certain areas within the city. Therefore problems of under-nutrition and over-nutrition emerged side by side in our findings. This problem is commonly faced by developing or newly developed countries in Asia.⁷

The problem of overweight might be caused by physical inactivity where the urban children indulged more on inactive leisure time activities such as television viewing, playing computer games and surfing the net. Spending more time sedentarily seemed to have a positive relationship with obesity.⁸ In addition, the abundance of

food supply may have caused overeating and over-consumption of nutrient dense food such as high calorie and high fat food.⁹ The aggressive promotion of fast food to children and adolescents may have been another cause of regular or frequent consumption of fast food which is high in fat and high calories. Families with double incomes have greater buying power and less time for home cooking. This may result in more frequent eating out and higher intakes of energy dense, high fat, nutrient poor (especially saturated fat) foods.^{9,10}

In this study where students were between 11 and 16 years, 7.5% boys and 7.1% girls were considered overweight under the specified criteria of the study. The prevalence rates of overweight among the three ethnic groups were quite similar which fell in the range of 6.7% to 7.8%. A similar study conducted by Kasmini *et al.*,¹¹ on school children aged 7 to 16 years old in Kuala Lumpur, gave an overall prevalence of overweight of 9.5% with Indian students being the group with the highest percentage (12.0%), followed by the Chinese (9.9%) and the Malays (8.9%). This difference could be due to the different age groups selected in Kasimani's study where his sample was younger (mean age of 11.8 years).

The prevalence of overweight for the Standard 5 students (average age 11 years) was 11.3% for boys and 8.6% for girls and our results are comparable to another study conducted among the 7 – 10 year old students from the primary schools in Kuala Lumpur¹² with 9.7% of boys and 7.1% of girls being overweight. There were less girls in the overweight category; this could be due to their earlier growth spurts compared to the boys (WHO technical report).⁴ For adolescents aged 14 (Form 2) to 16 years (Form 4), the prevalence of overweight was lower at 5.6% and 5.7% respectively. Similar results were reported in Kasimani's study¹¹ with the rates of 3.3% to 9.5%. This could be due to the fact that before puberty, these overweight/obese children were able to 'grow into' their desirable weight as they had their growth spurts.

Overweight and obesity among school children has been reported in many Asian countries. For example, the Singapore School Health Survey¹³ reported that the prevalence of obesity in the year 2000 was 14.7% in those aged 12- 13 years and 13.1% in those aged 15-16 years. In addition, a study conducted among the 7 – 9 years old school children in the Northeast of Thailand, urban Khon Kaen¹⁴ reported an obesity prevalence of 10.8%.

The prevalence of overweight in our study was considerably lower than among Singapore school children¹³ but this rate is higher than among Malaysian rural children.¹⁵ If action is not taken to address the problem, these rates are likely to escalate. Existing data indicates that childhood and adolescent obesity tends to predict adult obesity, and overweight children are more likely to become obese adults.^{16,17} Epidemiological data has shown that after adjustment for parental obesity, the odds ratio for obesity in adulthood associated with childhood obesity at 15–17 years of age was 17.5 (95% confidence interval, 7.7 – 39.5).¹⁸

A compilation of body mass index (BMI) of Malaysian adults by Ismail *et al.*,¹⁹ in urban areas showed that 29% of males and 26% of females were overweight and 5% of

males and 8% of females were obese. In the rural population, 21.4% were found to be overweight and 6.5% obese.²⁰ These figures suggested that a large proportion of Malaysian adults are overweight and so at higher risk for chronic diseases such as type 2 diabetes, hypertension and hyperlipidemia.²¹ These di-seases are also more common among children who are obese.²²⁻²⁵ The prevention of obesity in Malaysian adults could well begin with making sure that Malaysian children and adolescents do not fall into the overweight category.

Our findings also showed that 16.2% of boys and 13.3% of girls were underweight. Underweight was most prevalent in the 11 years age group (Standard 5) and became less prevalent in the older age groups. The 11 year old girls and the 14 year old boys were found to have the highest rates of underweight, possibly because of the different timing of their adolescent spurts. However, low socio-economic status (with lower income and more children in the family) may also have contributed to the proportions of underweight students as poverty still exists in the midst of mainstream affluence in Kuala Lumpur. The Indian students were found to have the highest prevalence of underweight among the 3 ethnic groups and this might be due to genetic factors.

In view of the co-existence of underweight and overweight in Kuala Lumpur, the authorities should address the problems through the education of parents and children in healthy lifestyles via the mass media and school settings. Healthy lifestyle such as healthy eating habits and the encouragement of physical activities in school or leisure time should be promoted among all age groups in the community. Measures to reduce poverty, such as the provision of better or cheaper housing, skill training for the unemployed or unskilled workers, promotion of family planning and the spacing of children, etc should be provided for the socio-economically deprived people. These measures should be implemented since both under- and over-nutrition will give rise to related diseases which will increase health care costs. School children are the future citizens and their health is essential to the country.

Conclusion

Under and over-nutrition among the school age children is currently a health problem faced by Malaysia. Appropriate steps need to be taken to address these problems in order to build up a strong and healthy nation in the future.

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