Longitudinal study on physical growth of primary school children in Malaysia

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Introduction

A CHILD'S growth achievement is a useful indicator of his well being and nutritional status, and can most easily be assessed by comparing his height and weight changes with the norms or standards derived from a relatively healthy population. Such standards are thus essential to professionals working with children, for example paediatricians, general practitioners, school health officers, nurses and teachers.

However standards of different countries may not be applicable to one another, because of differences in race and environment (Ashcroft et al 1964 and 1968, Dugdale 1972 and Tanner 1976). Further, even standards of an earlier generation may not be applicable to a later generation because of secular changes in the growth of children (Bakwin 1964). Each community must, therefore, work out its own up-to-date standards. Such standards are best derived from longitudinal growth studies. A search of the literature has shown that up to now, there has not been any longitudinal growth study of Malaysian school children. To fill this gap the longitudinal study reported below was conducted by following 686 Malaysian school children from 1969 to 1975.

Material and Methods

A group of children comprising Malays, Chinese and Indians were examined as part of the school health service examination. The children were attending four schools in Petaling Jaya. Those children with gross physical abnormalities, such as post poliomyelitis deformities, congenital heart disease and active chronic suppurative otitis media, were excluded from the study leaving a total of 686 children, who were followed yearly from 1969 to 1975. The dates of birth of the children were obtained from birth certificates and the age of each child was calculated therefrom. The household incomes and occupations of the parents were obtained by interviewing parents or obtained from questionnaires and the school registers. Weights, heights, left triceps skinfold thicknesses, left mid-arm circumferences were measured at yearly intervals. However only the results of weights and heights will be presented in this paper.

In general, the methods of measurements used were those suggested by Jelliffe (1966). Each child was weighed on an Avery beam balance accurate to one ounce, and was lightly clad with a standard thin cotton school uniform. Measurements were read to the last complete ounce. The height was measured by means of a Microtoise of French manufacture. The child, without shoes,, was positioned in the standard manner (Jelliffe 1966) below the Microtoise. The head piece was then brought to rest on top of the head and the reading taken direct at the viso hairline and to the last complete 0.1 cm.

The weight and height values at the 3rd, 10th, 25th, 50th, 75th and 90th percentiles at the various age groups for boys and girls separately were obtained with the aid of a computer.

Growth curves were drawn with a minimum of visual smoothing.

Results

The frequency distribution of children according to ethnic group, sex and income is shown in Table I.

Table I

Frequency distribution of children by ethnic group, sex and income

Monthly household income (M $)	Malay			Chinese			Indian			Grand Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0 – 199	14	35	49 (53.8)*	32	45	77 (19.5)*	70	92	162 (80.6)*	116	172	288 (42.0)*
200 – 399	7	18	25 (27.5)	93	101	194 (49.2)	10	12	22 (10.9)	110	131	241 (35.1)
400 and above	9	8	17 (18.7)	60	63	123 (31.2)	5	12	17 (8.5)	74	83	157 (22.9)
All income group	30	61	91 (100%)	185	209	394 (100%)	85	116	201 (100%)	300	386	686 (100%)

* Numbers in parentheses are percentages.

The weight and height curves for boys and girls are shown separately in figures 1, 2, 3 and 4. For both weight and height, the Boston 50th percentile (Nelson 1964) approximates to the Malaysian 90th percentile. For weight 80% of the Boston 50th percentile lies approximately at the Malaysian 50th percentile weight curve, while for height 95% of the Boston 50th percentile lies at the Malaysian 50th percentile height curve. The Wellcome Working Party (1970) classified malnutrition according to body weight. The point at which malnutrition begins was defined as a reduction in body weight below 80% of the Boston 50th percentile. Waterlow (1972 & 1974) classified malnutrition according height for age. The point at which malnutrition (stunting) begins was defined as a reduction in height below 95% of the Boston 50th percentile. Thus according to the above classifications, children whose weights or heights fall below the Malaysian 50th percentile would be classified as malnourished.

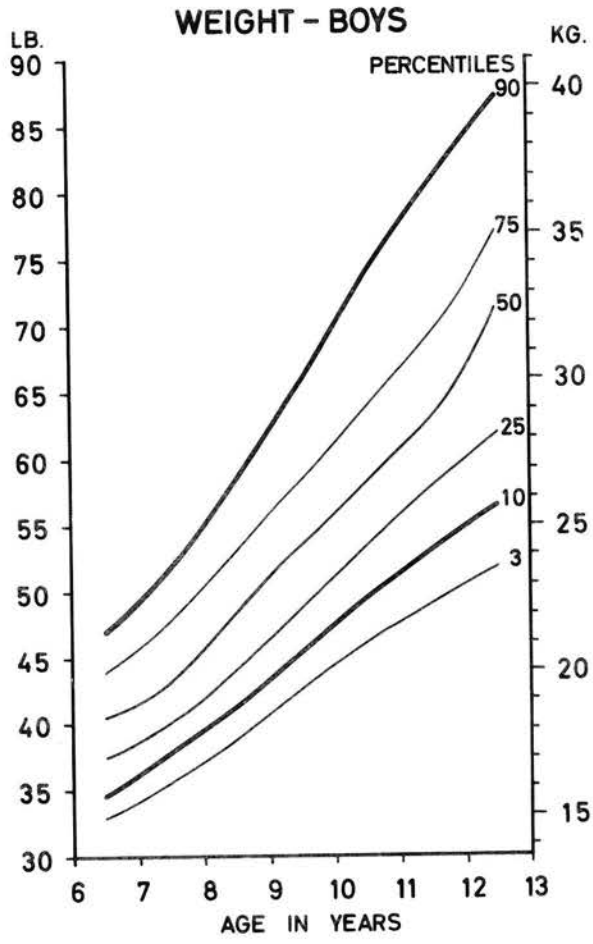

Fig. 1. The percentile chart for weight of Malaysian boys from 6 to 12 years.

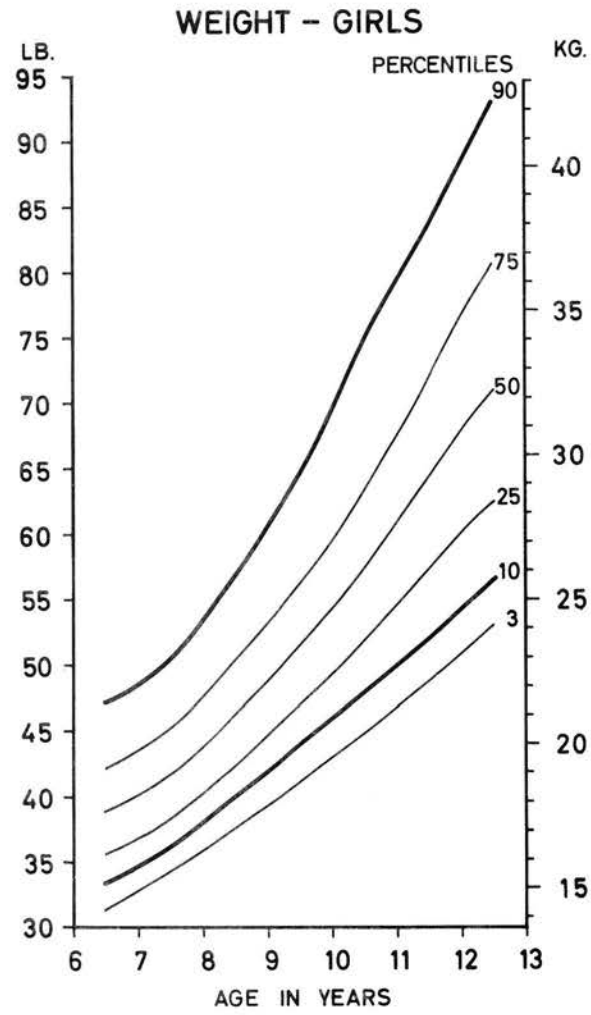

Fig. 2. The percentile chart for weight of Malaysian girls from 6 to 12 years.

Discussion

The population, from which the present growth curves were derived, consisted of children from 3 ethnic groups namely Malays, Chinese and Indians. In a previous cross-sectional study (Chen 1976) it has been shown that, although the growth achievement of the three ethnic groups differed as a whole, the growth achievement of higher income group children among the three ethnic groups did not differ significantly. On this basis the growth data of the three ethnic groups have been combined together in the preparation of the standard Malaysian

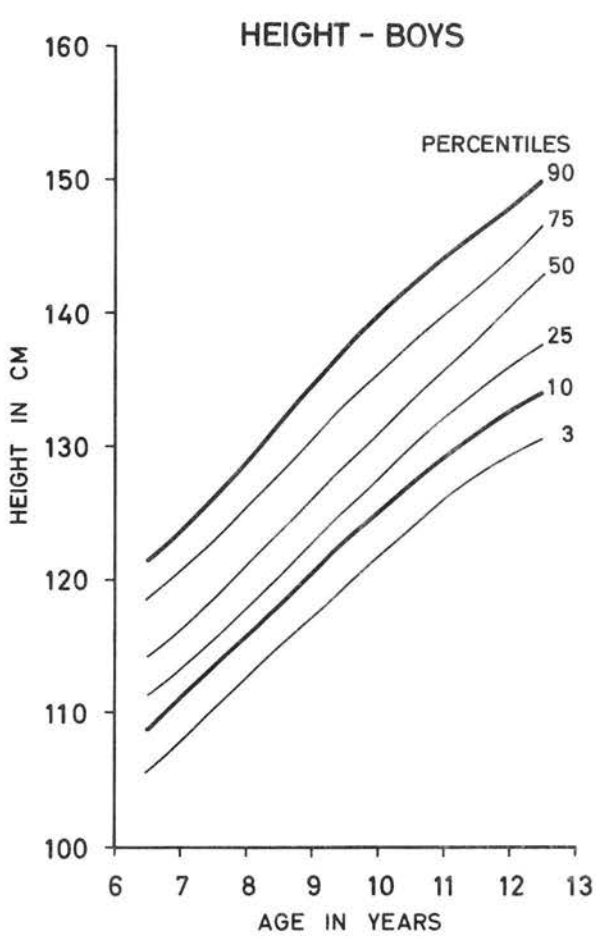

Fig. 3. The percentile chart for height of Malaysian boys from 6 to 12 years.

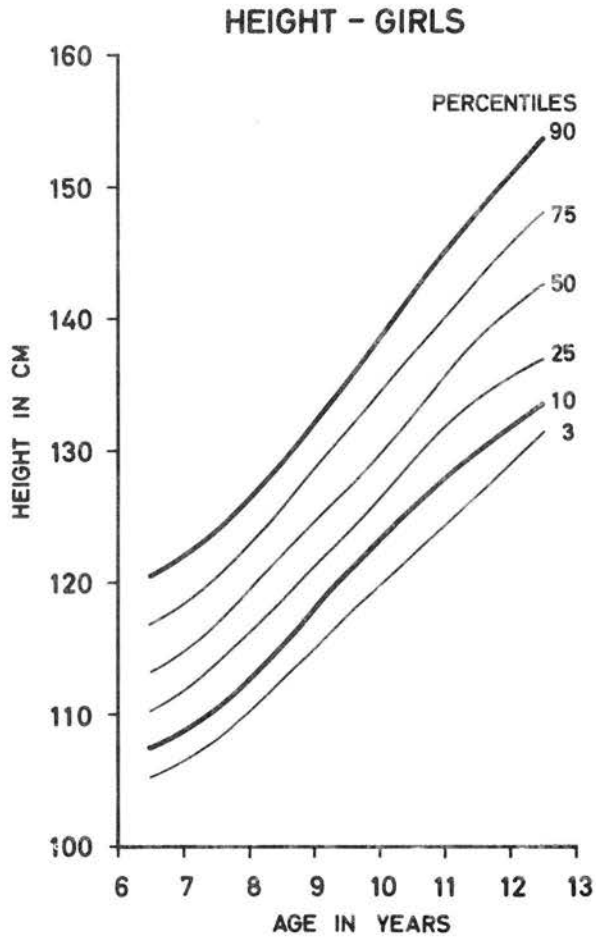

Fig. 4. The percentile chart for height of Malaysian girls from 6 to 12 years.

growth charts shown in figures 1, 2, 3 and 4. However since the study population consists of children from different socio-economic backgrounds, the norms shown here do not represent the ideal growth but the average growth.

In developing countries, such as Malaysia, where malnutrition is common, disease load is high, and the available medical and health services are limited, it is important to be able to separate out those with ill health and in need of care from those who are relatively healthy. This can be rapidly achieved by means of growth measurements e.g. weights and heights. The value of growth charts is illustrated from a previous cross-sectional study of Malaysian primary school children (Chen submitted for publication). In this study one third of the children were found to have a significant degree of deficit in weight for age (underweight) and height for age (stunting), but only 9% were found to have a significant degree of deficit in weight for height (wasting), that is were suffering from current malnutrition. According to Waterlow's criteria (1974) only 9% of these children require treatment. Thus in Malaysia, children whose measurements (weight and height) are below the 10th percentile should be considered at risk of significant malnutrition or growth retarding pathology and require active treatment. Values plotted between the 10th and 50th percentiles, indicate "below average growth" and children consistently in this intermediate range may be in a state of marginal malnutrition or have suffered from malnutrition in the past. Children whose measurements are between the 50th and the 90th percentiles are unlikely to be in nutritional difficulty.

These growth charts are designed primarily for the use of those who care for primary school children e.g. teachers, school health doctors and nurses, paediatricians and general medical practitioners, whereby children with significant growth retardation may be identified and treatment instituted. As the growth charts are not based on ideal growth but on "average growth", they are useful in screening the "sick" from the relatively healthy. When the state of health and nutrition of the population improve, these growth charts will need to be revised.

Summary

Standards for weight and height charts for Malaysian primary school boys and girls are presented. These allow for the ready identification of children at risk of significant malnutrition or growth retarding pathology and for the institution of appropriate treatment.

Acknowledgement

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