

HEAD CIRCUMFERENCE OF MALAYSIAN SCHOOL CHILDREN

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SUMMARY

Percentile head circumference charts, from six to eleven years of age, for boys and girls are presented. These can be used to monitor the head circumference of Malaysian children.

INTRODUCTION

A knowledge of the normal growth of head circumference and its variations is important in paediatric practice and standards are essential for professionals working with children such as paediatricians and general practitioners. Studies have shown that there are substantial racial and regional differences in head circumference.¹ Therefore standards from one racial group may not be applicable for another group. Such standards are best obtained from a relatively healthy population of genetically similar children.

Dugdale *et al.*,² and Chen³ have published head circumference of Malay pre-school children. However, there is no published information regarding head circumference of Malaysian school

children. The present paper presents head circumference charts of Malaysian school children from six to eleven years of age.

MATERIALS AND METHODS

From February to April 1972, five primary schools in Kuala Lumpur and Petaling Jaya were surveyed. Children with gross physical abnormality were excluded from the study. Altogether 3,024 children, aged six to eleven years, were studied. Of these 1,045 were Malays, 1,410 Chinese and 569 Indians. Table I shows the distribution of children by ethnic group and sex.

The dates of birth of the children were obtained from birth certificates and the age of each child was calculated therefore. The household incomes and occupations of the parents were

TABLE I
DISTRIBUTION OF CHILDREN BY ETHNIC GROUP AND SEX

Ethnic group	Number of children		
	Boys	Girls	Total
Malay	468	577	1,045
Chinese	737	673	1,410
Indian	266	303	569
Total	1,471	1,553	3,024

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TABLE II
DISTRIBUTION OF CHILDREN BY ETHNIC GROUP
AND HOUSEHOLD INCOME (M\$)

Ethnic group	Household income				Total	
	Less than \$500		\$500 and above			
	No.	(%)	No.	(%)	No.	(%)
Malay	939	(89.9)	106	(10.1)	1,045	(100)
Chinese	812	(57.6)	598	(42.4)	1,410	(100)
Indian	500	(87.9)	69	(12.1)	569	(100)
Total	2,251	(74.4)	773	(25.6)	3,024	(100)

obtained by interviewing parents or from returns of questionnaires and the school registers.

The children were from a mixed socioeconomic background. Table II shows the distribution of children by income group. It can be seen that 74% of the children were from families with household income of less than M\$500 per month. The median monthly household income was M\$213. Of the three ethnic groups, the Indians were the poorest, the Malays were better off, while the Chinese had the highest income, the median monthly income being \$145, \$170. and \$359 respectively.

The head circumference was measured by fibre-glass tapes. The tape was placed firmly round the frontal bones just superior to the supraorbital ridges, then passed round the head at the same level on each side and then was laid over the occipital prominence at the back, so as to measure the maximum circumference. The measurement was read to the last complete 0.1 cm and recorded.

Data were punched on to IBM cards and analysed with the aid of a computer. Data for boys and girls were analysed separately. The head circumference means, standard deviations and values at the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles at the various age groups were obtained. Since the mean and median at each age group were found to be similar (Table II), normalised percentile values at the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles were

used for the construction of growth curves which were drawn with a minimum of visual smoothing.

RESULTS

Table III compares the mean head circumferences of boys and girls from six to eleven years of age. It can be seen that the mean head circumference of boys is larger than that of girls by 1.1 cm at age six years, about 0.8 cm at ages seven to ten years, and 0.5 cm at age eleven years. Test shows that this sex difference is statistically significant ($p < 0.001$).

Table IV compares the mean head circumferences of Malay, Chinese and Indian boys and girls from six to eleven years of age. It shows that, on the average, Chinese boys and girls have the largest head circumference, Indians the smallest while Malays were intermediate. Analysis of variance shows that these differences are statistically significant ($p < 0.01$ to < 0.001).

TABLE III
MEAN AND MEDIAN HEAD CIRCUMFERENCE (CM)
OF BOYS AND GIRLS BY AGE

Mean age (years)	Boys		Girls	
	Mean	Median	Mean	Median
6.6	50.0	50.0	48.9	48.9
7.5	50.2	50.2	49.4	49.5
8.5	50.6	50.6	49.8	49.7
9.5	50.9	51.0	50.0	50.0
10.5	51.0	51.2	50.2	50.0
11.5	51.5	51.4	51.0	51.0

TABLE IV
MEAN HEAD CIRCUMFERENCE (CM) OF
CHILDREN BY SEX, AGE AND ETHNIC GROUP

Sex	Mean age (years)	Chinese	Malay	Indian
Boys	6.6	50.6	49.6	49.3
	7.5	50.8	49.5	49.7
	8.5	51.0	50.3	49.7
	9.5	51.4	50.5	50.3
	10.5	51.7	50.8	50.0
	11.5	51.9	51.2	50.8
Girls	6.6	49.5	48.7	48.4
	7.5	50.0	49.0	48.7
	8.5	50.2	49.5	49.2
	9.5	50.2	49.8	49.7
	10.5	50.7	50.1	49.7
	11.5	51.2	51.1	50.5

Table V compares the mean head circumferences of Malay, Chinese and Indian boys and girls (monthly household income M\$500 or above) from higher income groups. It can be seen that the average head circumferences of these Malay, Chinese and Indian boys and girls respectively are very similar.

Tables VI and VII give the standard deviations and normalised percentiles of head circumference by age for the 1,471 boys and 1,553 girls respectively.

Normalised percentile curves of head circumference, from six to eleven years of age,

TABLE V
MEAN HEAD CIRCUMFERENCE (CM) OF CHILDREN,
WITH MONTHLY HOUSEHOLD INCOME OF M\$500
AND ABOVE, BY SEX, AGE AND ETHNIC GROUP

Sex	Mean age (years)	Chinese	Malay	Indian
Boys	6.6	50.6	50.5	51.5
	7.5	51.1	51.1	52.1
	8.5	51.3	51.5	52.0
	9.5	51.9	51.8	53.8
	10.5	52.0	51.1	51.7
	11.5	52.4	52.2	52.1
Girls	6.6	50.0	50.5	49.4
	7.5	50.5	50.0	49.8
	8.5	50.9	50.4	51.0
	9.5	50.8	50.6	51.2
	10.5	51.5	50.7	51.5
	11.5	51.1	51.4	51.4

for boys and girls are shown in Figs. 1 and 2 respectively.

DISCUSSION

This study confirms the results of others that, on the average, boys have larger head circumference than girls.^{1,4} For example, Meredith¹ in a comparative study of children on a worldwide basis, concluded that within a particular racial or regional group, males tend to be larger than females in average head circumference from infancy to adulthood.

TABLE VI
STANDARD DEVIATIONS (S.D.) AND NORMALISED PERCENTILES OF HEAD CIRCUMFERENCE (CM)
OF BOYS BY AGE

Median age (years)	Sample size	Normalised percentiles							S.D.
		3rd	10th	25th	50th	75th	90th	97th	
6.6	233	46.8	47.8	48.9	50.0	51.2	52.2	53.2	1.71
7.5	272	47.2	48.2	49.1	50.2	51.3	52.3	53.2	1.60
8.5	265	47.6	48.6	49.5	50.6	51.7	52.7	53.7	1.59
9.5	231	47.9	48.8	49.8	50.9	51.9	52.9	53.9	1.58
10.5	227	48.2	49.1	50.0	51.0	52.0	52.9	53.8	1.48
11.5	243	48.5	49.4	50.4	51.5	52.5	53.5	54.5	1.58

TABLE VII
STANDARD DEVIATIONS (S.D.) AND NORMALISED PERCENTILES OF HEAD CIRCUMFERENCE (CM)
OF GIRLS BY AGE

Mean age (years)	Sample size	Normalised percentiles							S.D.
		3rd	10th	25th	50th	75th	90th	97th	
6.6	200	45.9	46.9	47.9	48.9	50.0	51.0	51.9	1.60
7.5	266	46.4	47.3	48.3	49.4	50.5	51.5	52.4	1.61
8.5	330	46.9	47.9	48.8	49.8	50.8	51.7	52.6	1.51
9.5	262	47.2	48.1	49.0	50.0	51.0	51.8	52.7	1.47
10.5	252	47.5	48.3	49.2	50.2	51.2	52.1	53.0	1.47
11.5	243	48.3	49.2	50.0	51.0	52.0	52.9	53.7	1.44

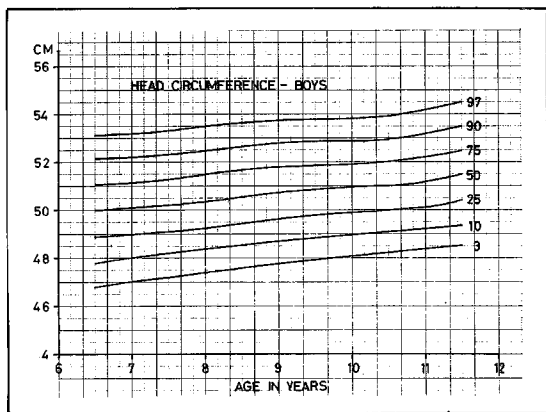


Fig. 1 Normalised distance percentile curves of head circumference of boys, aged from six to eleven years.

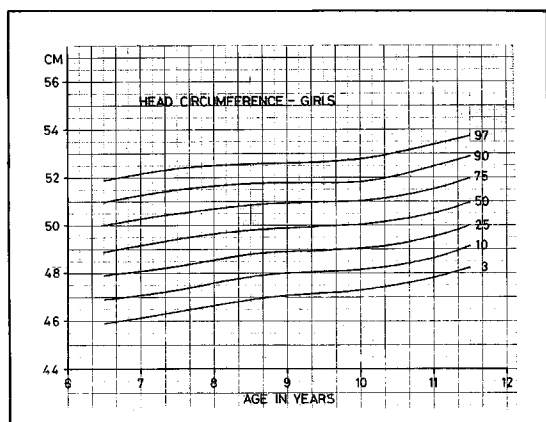


Fig. 2 Normalised distance percentile curves of head circumference of girls, aged from six to eleven years.

The result of this study shows that, although there is a difference in average head circumference among the three ethnic groups, this difference disappears when income is taken into consideration. Therefore the difference in head circumference among the three ethnic groups is most probably due to differences in socioeconomic backgrounds of the children under study (the Chinese had the highest income and the Indians the lowest). The fact that children from higher income families grow better and had larger head circumferences than those from poorer homes, has been well documented by several workers.^{3,5,6,7}

Since the difference in head circumference between the three ethnic groups is most probably due to environmental and not genetic differences, head circumference data of the three ethnic groups had been combined for the construction of head circumference charts (Figs. 1 and 2). These charts can be used to monitor the head circumference of Malaysian school children.

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