Lung Function in Malay Children

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Summary

We conducted a study to measure the peak expiratory flow rate (PEFR), forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV_1) in a group of normal Malay primary school children aged 7 to 12 years. PEFR was measured in 920 children (482 boys and 438 girls) while FVC and FEV_1 were measured in 292 of them (168 boys and 124 girls). In agreement with previous studies, we found that PEFR was correlated with age and height of the subjects but FVC and FEV_1 were correlated with height only. Prediction equations for all 3 lung function indices for Malay boys and girls were formulated. In comparison with the lung function values from Western and Chinese subjects, the lung function values in our subjects are lower.

Key words: Lung function test, Malay, spirometry, children.

Introduction

Tests of lung function using peak flow meters and spirometers are a useful means of evaluating ventilatory function. The tests are simple and can be easily performed in the outpatient. The normal ranges of lung function values are subject to well-recognised racial and ethnic differences[1-3]. Several normograms and prediction equations based upon age, sex and height have been established, particularly in the adult population. Most of these normograms are based on studies performed on European or American subjects[4-6]. Lung function studies have also been done in other ethnic groups, particularly in African, Indians and Chinese subjects[1,2,6-10]. In Malaysia, a study of peak expiratory flow rates has been done on aboriginals[11], but to our knowledge there is no published data on lung function tests on Malay children. The aim of this study was to establish the normal ranges and prepare prediction equations for PEFR, FVR, FEV_1 in normal Malay children and to compare our results with those found in other ethnic groups.

Material and Methods

Nine hundred and twenty primary school children between the ages of 7 to 12 years in 5 schools in Kota Bharu, Kelantan, were studied. From each school, all students in one randomly chosen class of each year of schooling (standards 1 to 6) were included. All the children were Malays. A brief history and physical examination was carried out to exclude those with cardiovascular or respiratory diseases. Weight and height were measured without shoes. The weight of each subject was measured using the same weighing machine throughout the study and was recorded to the nearest half of a kilogram. Height was recorded to the nearest centimeter and age was recorded to the nearest year. The PEFR test was measured using the same Wright peak flow meter throughout the study. The FVC and FEV_1 were determined from an FVC manoeuver performed on a Vitalograph dry spirometer. The Vitalograph was calibrated with a 3-litre syringe at the start of each day of the study. The peak flow and FVC manoeuvers were demonstrated by the authors to each subject, after which the subjects performed the maneuvers with encouragement from friends and the authors. Each subject was observed to have completed the manoeuvers satisfactorily, which met the acceptable criteria set by the American

Thoracic Society[12]. The best results from 3 acceptable performances for PEFR and FVC manoeuvers were recorded.

Result

The mean, ranges and standard deviations for the physical characteristics of the subjects are shown in Table I. Girls are slightly older, taller and heavier than boys but these differences are not significant ($p>0.05$). Table II shows the mean values and standard deviations for height and lung function indices according to sex and age groups. All the lung function values are higher in boys than in girls and show a steady increase with age. Regression analysis was done using the Microstat statistical programme which reveals that for both sexes the PEFR is significantly correlated with height and age but the FVC and FEV_1 are correlated only with height. The prediction equations for PEFR, FVC and FEV_1 were calculated for our subjects and these are shown in Table III. Comparisons were then made on the lung function indices based on our prediction equations to those found in studies on Caucasians by Lunn in Sheffield[4] and on Hong Kong Chinese[10] by Lam et al. Based on the prediction equations in each study, comparative graphs for the lung function indices were constructed for 8 year old subjects. These are shown in Figures 1 to 5. These figures should also apply to all ages, since the prediction equations use only height as the predictor variable. It is obvious that for all lung function indices, the values in our subjects are lower than those found in the Caucasian or the Chinese subjects.

Discussion

There are considerable ethnic and racial differences in normal values of lung function tests. Most studies of lung functions were conducted in Western subjects. Studies have also been conducted in Pakistanis[6], Chinese in Hong Kong and Singapore[1,7,9,10] and Africans[2,8]. Dugdale *et al* did a study of lung function among Malaysian aboriginals[11], but to our knowledge there is no published report on lung function in Malay children.

In agreement with other studies of lung function in Asians, the lung function values in Malay children are lower than those in the Caucasians. The values are also lower than those in the Chinese subjects. Dugdale *et al* [11] also found that the predicted values of PEFR, FVC and FEV_1 among Malaysian aboriginal adults and children were lower compared to Western subjects. The reason for this difference is not clear. It is possible that this is due to true biological differences between Malay children and children from other races. Since almost all our subjects

Table I
Lung function test in Malay children - ranges, means and standard deviations for age, weight and height

		Range	Mean±standard deviation
Boys			
	Age (years)	7-12	9.43±1.78
	Weight (kg)	12.0-52.5	24.38±6.14
	Height (cm)	101-166	125.69±12.19
Girls			
	Age (years)	7-12	9.82±1.93
	Weight (kg)	14.0-62.0	26.27±8.14
	Height (cm)	102-178	128.96±12.33

were Malays, it may explain the low values based on ethnic differences. However, this needs to be confirmed by comparative studies of lung function values between other races in Malaysia.

In conclusion, we have studied the PEFR, FVC and FEV_1 in normal Malay school children and calculated prediction equations to establish the normal ranges of lung function among Malay children. We found that the values of lung function in our subjects were lower in comparison to other races.

Table II
Lung function test in Malay children - mean values and standard deviations for height and lung function indices

		Mean±standard deviation			
Age (yrs)	No of subjects	Height (cm)	PEFR (l/min)	FVC (litres)	FEV_1 (litres)
Boys					
7 - 8	194	116.67±4.72	206.48±34.92	1.05±0.18	0.96±0.16
9 - 10	127	126.69±5.33	247.30±43.95	1.29±0.21	1.17±0.18
11 - 12	161	135.89±6.34	297.45±51.94	1.53±0.30	1.39±0.29
Girls					
7 - 8	133	116.38±4.64	196.47±32.68	0.97±0.19	0.93±0.18
9 - 10	127	126.91±5.93	234.53±40.87	1.23±0.22	1.12±0.21
11 - 12	178	139.60±6.22	297.04±54.70	1.59±0.33	1.46±0.30

Table III
Lung function test in Malay children - prediction equations for peak expiratory flow rate, FVC and FEV_1

	Indices	Prediction formula	R
Boys			
	PEFR	15.14 Age + 1.5 Ht-88.54	0.71
	FVC	0.021 Ht - 1.503	0.66
	FEV_1	0.02 Ht - 1.67	0.52
Girls			
	PEFR	4.34 Age + 3.31 Ht -226.71	0.74
	FVC	0.02 Ht - 1.45	0.63
	FEV_1	0.23 Ht - 2.021	0.71

R=Regression coefficient; Ht=Height in cm.

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