PEAK EXPIRATORY FLOW RATES OF HEALTHY TRIBAL CHILDREN LIVING AT HIGH ALTITUDES IN THE HIMALAYAS

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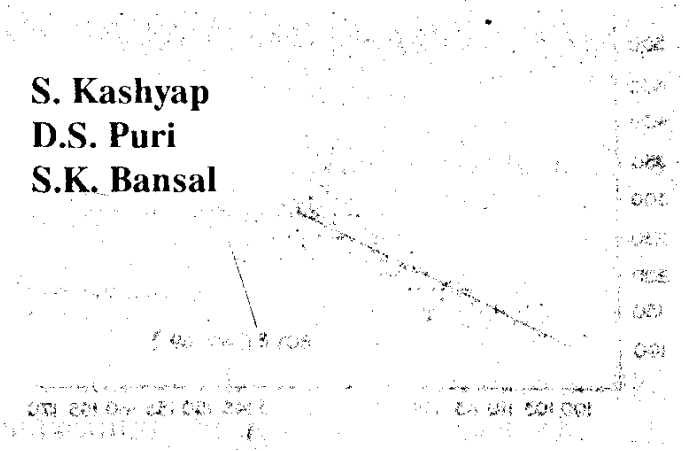

ABSTRACT

Peak expiratory flow rates (PEFR) of 237 healthy tribal children living at or above 3000 metres from sea level were measured. The mean age, height and PEFR for boys were 10.7 years, 130.7 cm, 245.5±74.0 l/min, respectively. The values of these parameters in girls were 10.5 years, 128.2 cm and 222.3±78.6 l/min. The PEFR of these children, especially for boys, were comparable with North Indian urban children or children of the West.

Key words: *Peak expiratory flow rate, High altitudes, Tribal children.*

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Ventilatory lung functions in healthy children of plains of Northern India have been well documented(1-3). A section of the population of Himachal Pradesh lives in the two tribal districts of Lahaul Spiti and Kinnaur of this hilly State. Although, majority of the population lives in the valleys, some villages are situated in the high altitude region, *i.e.,* 3000 metres or more above sea level. The ventilatory functions for these tribal highlanders of the Himalayas have not been described. In the present report we have measured the peak expiratory flow rates (PEFR) in healthy tribal children of Himachal Pradesh living at high altitudes in the Himalayas.

Material and Methods

Two hundred and thirty seven healthy children of Keylong (height 3165 metres), the district headquarters of Lahaul and Spiti and adjoining villages were included in the study. These children belonged to mixed races of Vedic Aryans of India, Khas Aryans from Hindu Kush and Mangols from Western Tibet. A detailed history was obtained followed by clinical examination to rule out any clinical problem pertaining to cardio-respiratory system including the thoracic cage abnormalities. Age was recorded to the nearest completed year. Height and weight were measured by using standard techniques. The peak expiratory flow rates (PEFR) for these children were measured on mini Wrights peak flow meter which was previously standardized. The PEFR was measured in standing posture after careful and proper demonstration of the methods to each child. At least three

readings were obtained and the highest figure was used for analysis. The data was analyzed separately for males and females, which was processed by the computer and subjected to standard statistical analysis. Regression equations based on height were constructed for both the sexes.

Results

Of the 237 children studied, there were 139 boys and 98 girls. Their age ranged between 7-14 years. Mean age, height, weight and PEFR for both the groups are depicted in *Table I*. *Table II* shows the co-efficient of correlation between PEFR and height. The regression equations for both the groups are as follows:

Boys: PEFR (l/min) =
$-406.07 + 5.07 \times$ height (cm)
SEE ± 33.26.

Girls: PEFR (l/min)
$= -354.1 + 4.41 \times$ height (cm)
SEE ± 37.4

TABLE I— *Mean and SD of Physical Parameters and PEFR in Tribal Children*

Parameters	Boys (n = 139)	Girls (n = 98)
Age (years)	10.7	10.5
Height (cm)	130.7 ± 15.7	128.2 ± 12.8
Weight (kg)	27.4 ± 6.8	26.6 ± 8.5
PEFR (l/min)	245.5 ± 74.0	222.3 ± 78.6

TABLE II— *Coefficient of Correlation between PEFR vs Height*

Sex	Height	p value
Boys (n = 139)	r = 0.8934	< 0.005
Girls (n = 98)	r = 0.8833	< 0.005

Table III shows the comparative values of height standardized PEFR (boys 130 cm; girls 128 cm) in different studies.

Figures 1 & 2 show the distribution of individual values of PEFR for boys and

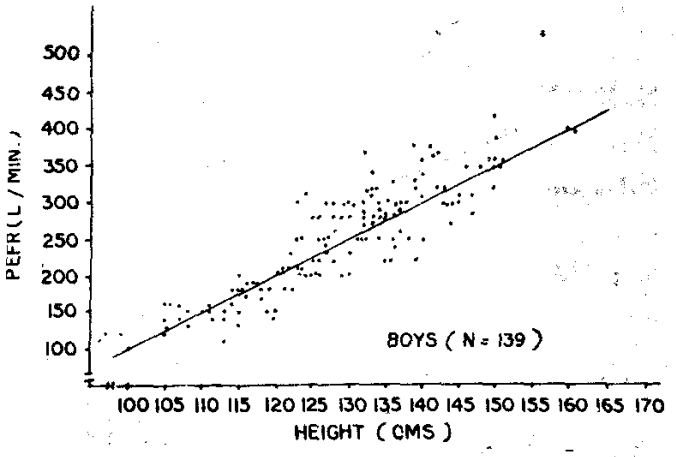

Fig. 1. Showing individual values of PEFR of boys plotted against height.

TABLE III— *Comparison of Height Standardized (Boys 130.0 cm; Girls 128.0 cm) Values of PEFR in Different Studies*

Studies	PEFR (l/min)	
	Boys	Girls
Present study (High Lander Tribal) H.P.	253	210
Parmar *et al.*(1) (Chandigarh; India)	248	262
Murray and Cook(7) (Boston)	261	151
Nairn *et al.*(8) (Scotland)	250	241

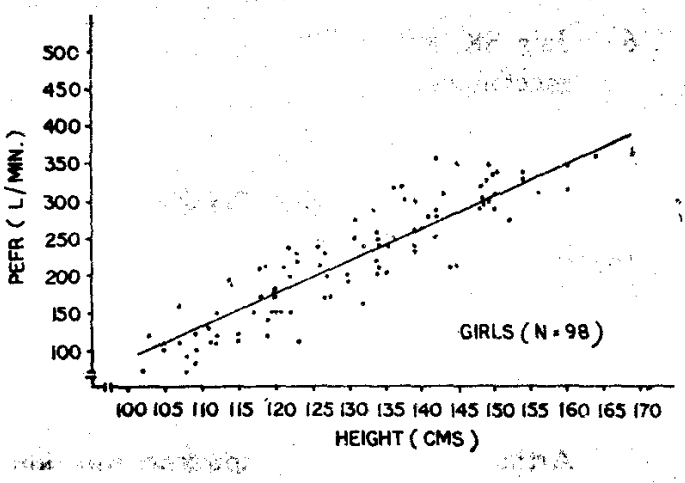

Fig. 2. Scatter of PEFR for girls plotted against height.

girls, respectively plotted along the derived regression equations.

Discussion

The ventilatory lung functions like maximum breathing capacity (MBC), forced vital capacity (FVC) and forced expiratory volume in first second (FEV_1) have compared well with peak expiratory flow rate. The PEFR of Indian adults are lower than Western adults(4). However, in an earlier study PEFR of urban healthy children of North India were comparable with that of the West(1). PEFR has linear positive correlation to height, age and weight. We have taken height as one of the parameters to predict and correlate PEFR in this study because it is easy and accurate to document in field studies. The study has shown positive correlation between PEFR and height (*Figs. 1 & 2*) which is in conformity with other studies(1-3).

Altitude may play an important role in determining the size of the lungs; other factors like hypoxia and low ambient pressure at altitude may also be contributing to the overall pattern of lung function tests in highlanders. The vital capacity of the Peruvians and Bhutanese living at high altitudes had much higher values than their counterparts at sea level(5).

Jain and Ramiah have reported lower values of ventilatory functions for Indian children when compared to Western children(6). In the present study however, the PEFRs of the healthy Highlander tribal children was similar to healthy children of the West or Lowlander urban North Indian children (*Table III*). We observed slightly lower values of PEFR in girls. The factors that determine PEFR are predominently expiratory muscle effort, lung elastic recoil pressure and airways size. The muscle effort in turn depends on the physical strength and physical activity. It is possible that these young tribal girls are not that physically active. Although, we have only measured PEFR in the present study, the higher values of PEFR in tribal boys, comparable with Western children could possibly be explained by their increased physical activity. Nevertheless, a further study of complete ventilatory lung functions is needed to understand the pattern of these functions in natives of high altitudes of Himalayas.

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NOTES AND NEWS

EIGHTH ASIAN CONGRESS OF PEDIATRICS

The Eighth Asian Congress of Pediatrics is scheduled to be held at New Delhi from *February 6-12, 1994.* Suggestions are invited for a suitable theme and logo for the Congress. The selected entries will be suitably acknowledged/rewarded. The suggestions may kindly be mailed to:

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