

PULMONARY FUNCTION TESTS IN SCHOOL CHILDREN

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Summary : Pulmonary Function tests were measured in 261 healthy boys and 254 healthy girls in the age group of 6 to 15 years with standard Benidects Roth type recording spirometer and Wrights Peak Flow Meter. The values of Pulmonary Functions were found to be increased with increase in age. For vital capacity this relation was curvilinear. All values were higher in boys than girls. There was significant positive correlation between pulmonary Function Tests Vital Capacity, (VC), Maximum Voluntary Ventilation (MV), peak Expiratory Flow Rate (PEFR) and anthropometric parameters like height, weight and body surface area. Equations were formed for prediction of V.C., M.V.V. and PEFR values in relation to the height. The values of Pulmonary Functions were lower when compared with Western Standards, but were comparable with different Indian Studies.

Key words : pulmonary functions in school children
correlation with anthropometric parameters

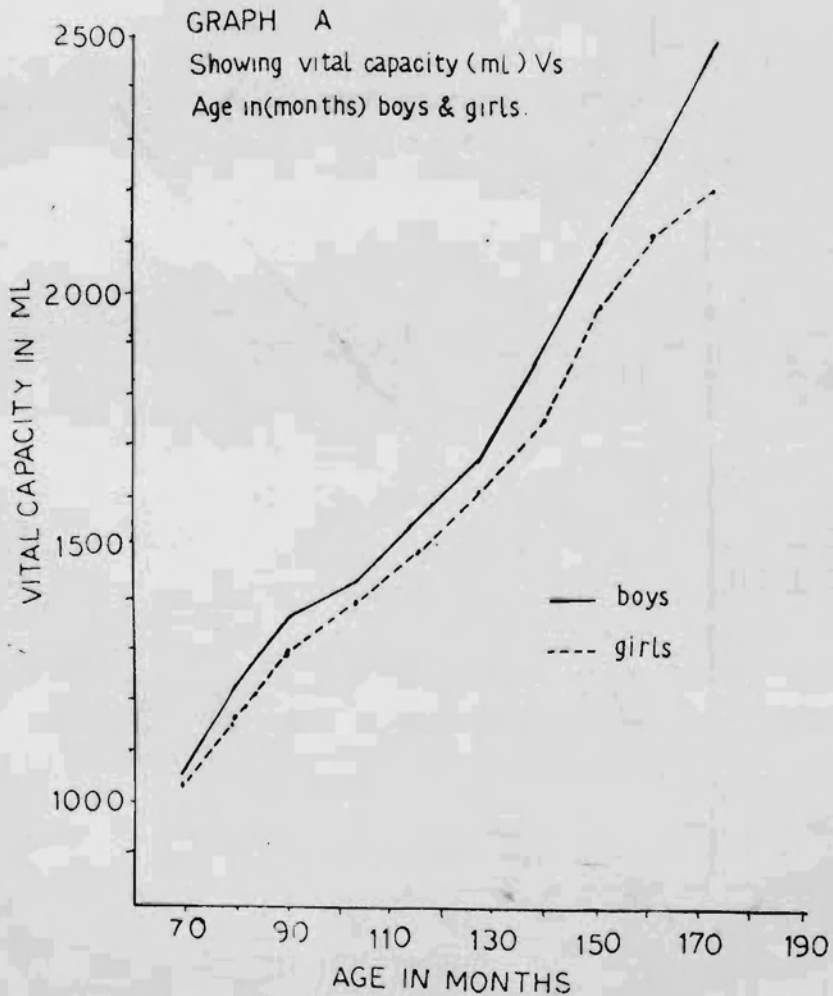
comparison between boys and girls
equations for prediction of values of
lung functions (V.C., M.V.V., P.E.F.R.)

INTRODUCTION

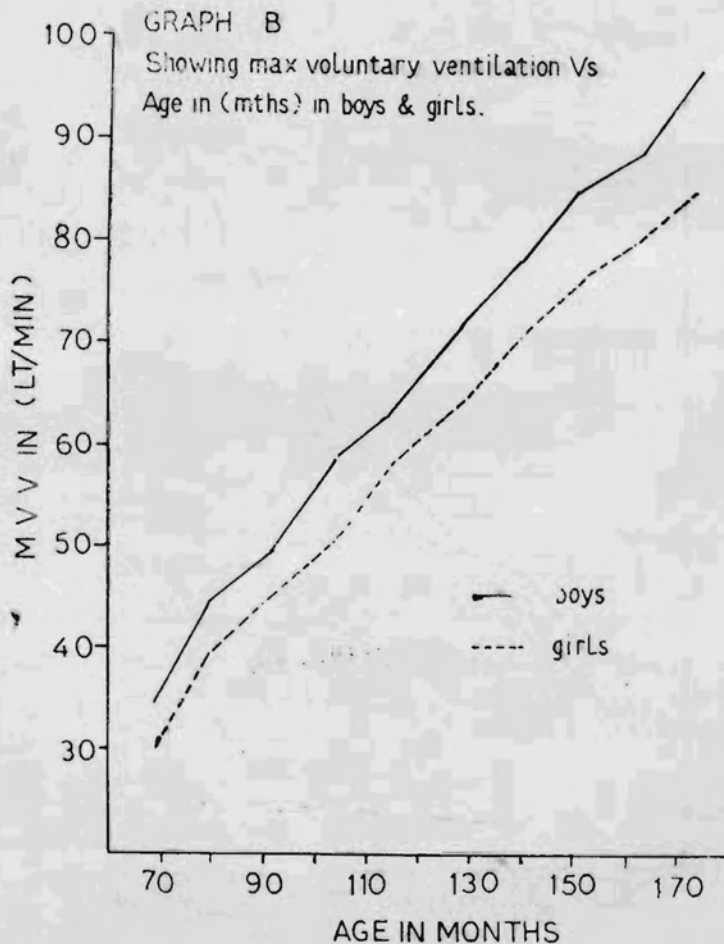
There are increasing No. of reports on Pulmonary Function Tests in Children from various part of the country. The values of Pulmonary Function Tests are influenced by anthropometric environmental, genetic, ethenic and socioeconomic and technological variations. Thus each laboratory should establish their own normal standards. The present work was undertaken to determine normal data for lung function tests in school children of Solapur City (Western Maharashtra). Comparison of values of lung function tests was made in boys and girls and also with other studies and effort has been made to form equation for giving prediction values for various lung functions like V.C., M.V.V., P.E.F.R. in boys and girls. These values can help in determining variation from normal in Pulmonary disorders. Correlation is also studied between various parameters and Pulmonary Function Tests.

MATERIAL AND METHODS

261 boys and 254 girls in age group of 6 to 15 years were studied from local primary school and high school. Care was taken to exclude those suffering from any disease of the chest or upper respiratory tract or allergic disorder. A thorough physical examination was carried out in all the children. Physical parameters like standing height was recorded in cms and weight in kg. Body surface area was calculated from Dubois body surface area Nomogram. Age of the child was verified from school birth records. Nutritional status of children was assessed according to the classification given by Nutrition Sub-Committee of Indian Academy of Paediatrics.



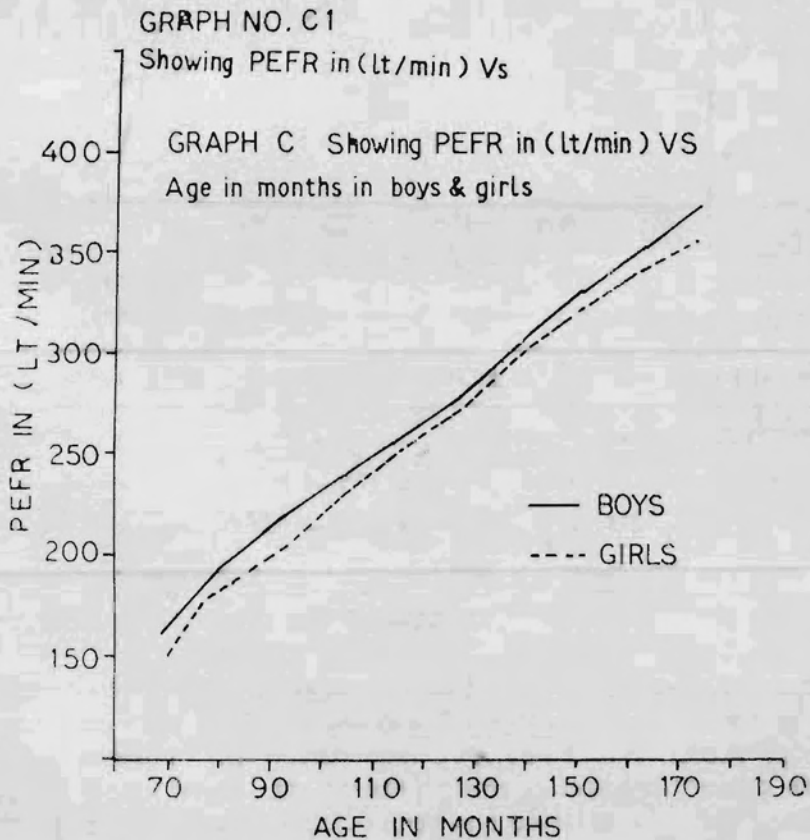
All subjects were given thorough instructions and demonstrations regarding the performance of Pulmonary Function Tests. Tracing on the spirogram were taken after being fully satisfied that subjects have understood the procedure of the tests. Lung function testing was done in sitting position using disposable mouth piece with nose clip applied. Forced vital capacity at one second and maximum voluntary ventilation were recorded by Benedicts Roth type recording spirometer. All readings were taken three times and best of the three was selected. All volumes were corrected to B.T.P.S. peak expiratory flow rates were recorded with wright's Peak Flow Meter. Best of the three



readings were recorded. Data was analysed statistically, the correlation coefficient between physical parameters and different lung function were worked out. Regression equations were formed for vital capacity, MVV and PEFR.

RESULTS

Mean values of V.C., M.V.R., P.E.F.R. in different age group in boys and girls are shown in graph A.B.C, respectively. Mean values of ratio of FEV_1/FVC ratios at different age groups in boys and girls is shown in graph 'D'. Regression equations of pulmonary functions in boys and girls are shown in Table I.



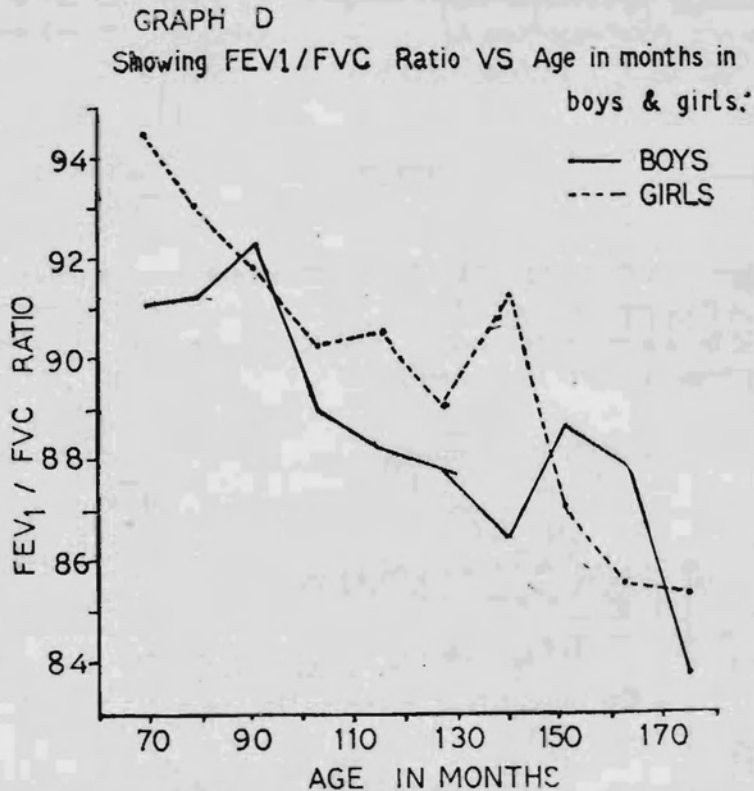


TABLE I : Regression equations based on height for various pulmonary Function Tests in boys and girls.

Regression equation of boys	±S.D.	Regression equation of girls	±S.D.
1. VC=1.560 X 10 ⁻³ X (Height in cms) ^{-2.85}	140	1. VC=2.00 X 10 ⁻³ X (Height in cms) - 2.78	110
2. MVV=1.148 X height in cms - 83.785	6.94	2. MVV=1.390 X height in cms - 122.50	7.62
4. PEFV=4.16 X height in cms - 274.189	27.76	3. PEFV=4.802 X height in cms - 371.075	26.25

DISCUSSION

All values of lung functions increased with age, FEV₁/FVC ratio was decreased with increase in age. Values of various Pulmonary Functions Tests were more in boys than girls (Graph A.B.C.) except FEV₁/FVC ratio (Graph D.) Positive correlation was found between different physical parameters like height, weight, body surface area and age, in boys and girls. It is observed that height and body surface area has best correlation coefficient amongst different physical parameters and pulmonary function tests. Best

correlation was also noticed by Kennedy *et al.* (10), Dugdale *et al.* (6) and Godfrey *et al.* (8). In a study done by Singh *et al.* (19) showed best correlation with body surface area followed by weight height and age in decreasing order. In similar study done by Chetty *et al.* (3). The correlation of vital capacity was highest with weight.

The regression equations for vital capacity maximum voluntary ventilation and peak respiratory flow rate in boys and girls are shown in Table I. As the vital capacity values were found to have a curvilinear relationship regression equation was formed after logarithmic conversion of data.

The values of this study are compared with similar studies done so far (1, 2, 3, 4, 5, 6, 7, 8, 9, 11). Out of these values those of Jain and Ramaih (9) and Chetty *et al.* (3) go hand in hand with present study. In other similar Western studies the values of vital capacity are on higher side except that of Dugdale *et al.* (6), and Godfrey *et al.* (8) whose values are nearer to our study. Values of vital capacity in this study are comparable with Singh *et al.* (19). Values were higher when compared with those of Deshpande *et al.* (5) probably because his subjects were from poor socioeconomic section of the society. When values were compared in relation to the height they were comparable with our study.

M.V.V. : The values of M.V.V. in present study go hand in hand with those of Singh *et al.* (19) and values are also consistent with those of Polgar *et al.* (18) and Kennedy *et al.* (10).

P.E.F.R. : The studies in adults in India have shown lower P.E.F.R. values when compared with Western figures. Values of P.E.F.R. are compared with their studies (5, 6, 7, 8, 11, 13, 14, 15, 16, 17, 18). This is in contrast with findings of studies shown lower values of ventilatory functions in Indian Children. A possible explanation of this observation may be due to the fact that children studied were comparable with those of Western studies. Values of Deshpande *et al.* (5) were lower probably because his subjects were from poor socioeconomic section. Most of the studies have been separate regression equations for boys and girls. Polgar *et al.* (18) who reviewed all the literature of pulmonary functions test had come to the conclusion that combined equation of P.E.F.R. can be formed for boys and girls. We also observed the similar findings as shown in Graph C₁.

FEV₁/FVC Ratio : The portion of vital capacity blown out in unit time in children is significantly higher than that of adults. This feature has been observed in this study as well as in Western Studies. Our values of FEV₁/FVC corresponds to those of Lion *et al.* (12). In this study the air blown out is in the tune of 88.6% and 89.9% (Table No. V) respectively in boys and girls in one second. Graph A B C₁ shows that values of different

pulmonary function tests are higher in boys when compared with girls. For vital capacity this difference increased as age is increased which is consistent with Zapletal *et al.* (22).

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