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RELATIONSHIP BETWEEN ANTHROPOMETRIC VARIABLES AND LUNG FUNCTION PARAMETERS AMONG SCHOOL CHILDREN OF CENTRAL INDIA: A CROSS-SECTIONAL STUDY

Physiology

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ABSTRACT

Background: Pulmonary function tests have been evolved from the tool for physiological study to clinical investigation in assessing respiratory status of the patients. The study was conducted to correlate pulmonary function test parameters with various Anthropometric parameters in school children between the age group 7 to 15 years.

Material and Methods: The study was cross sectional study conducted between February to June 2013. A total sample size 700 subjects in the age group of 7-15 years were included. Anthropometric parameters like weight, height, BMI, Body surface area (BSA) and arm span were recorded using standardized procedure. The pulmonary function parameters analysed included forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1) and peak expiratory flow rate (PEFR).

Results: All the anthropometric values and pulmonary parameter values are found to be higher in males as compared to females. There was significant correlation between pulmonary function parameters and anthropometric parameters in children.

Conclusion: It can be concluded that, anthropometric variables are strong determinants of pulmonary function among the children.

KEYWORDS

Anthropometry, lung function parameters, correlation, school children.

INTRODUCTION:

Pulmonary function tests (PFTs) are considered as an essential component for evaluation of lung functions. During last few decades, PFTs have been evolved from the tool for physiological study to clinical investigation in assessing respiratory status of the patients. The measurement of pulmonary function is also helpful in the diagnoses and management of diseases, monitoring of rehabilitation outcomes as well as in epidemiological surveys.[1,2]

Anthropometric measurements are an important, widely applicable, noninvasive, and inexpensive technique for assessing body size, proportions, and composition.[3] Differences in pulmonary function parameters like forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC) are due in part to differences in body proportions as well as several other factors. Moreover, ethnic group differences are largely due to the differences in anthropometric parameters.[4]

Pulmonary function that are reported for Indian children are mainly from northern and western parts of the country and there is a paucity of data on pulmonary function in normal central Indian children. India being a subcontinent, changes in pulmonary functions can occur between children of central India and children of other regions.[5,6]

Therefore, the study was therefore designed to investigate the relationship between pulmonary function test and selected anthropometric variables among school children.

OBJECTIVE: To correlate pulmonary function test parameters with various Anthropometric parameters in school children between the age group 7 to 15 years.

MATERIAL AND METHODS: The study was cross sectional study conducted between February to June 2015. A total sample size 700 subjects was calculated according to World Health Organization method for sample size calculation in health studies taking 95% confidence.[7] A total number of subjects included in the study were normal healthy school children with in the age group of 7-15 years irrespective of their sex, ethnicity or socioeconomic status. Children with infection like symptoms in last 2 weeks, acute or chronic respiratory diseases, major systemic disease like cardiac or renal problems, clinically significant anaemia, history of any allergy, bone deformity of chest or spine and any muscular weakness and family history of atopy, asthma or other chronic lung diseases were excluded from the study.

The study was conducted after approval of the Ethical Committee of the institute and written consent from parents/guardian and teachers. The study was carried after random selection of five Government aided school. A pre validated questionnaire was used in study. The questionnaire contains personal information, anthropometric measurements, general and systemic examination:

The personal information of the subject including age, sex were recorded. Anthropometric parameters like weight, height, BMI, Body surface area (BSA) and arm span were recorded using standardized procedure.[8] Pulmonary function tests were measured by using potable computerised PFT machine (Helios 401). Subjects were asked make three efforts with an interval of five minutes between two consecutive maneuvers and the best of three was recorded. Single expiratory maneuver gave the spirometric parameters required for study – FVC (Forced vital capacity in litres), FEV1 (Forced expiratory volume in one second in litres) and PEFR (Peak expiratory flow rate in litres/second). The data was analyzed using Excel 2010 and SPSS version 20. Correlation coefficient was calculated (Pearson's correlation coefficient) and p value < 0.05 was considered to be statistically significant.

OBSERVATIONS AND RESULTS:

Table 1: Anthropometric characteristics among subjects:

Anthropometric Characteristics	Females (Mean ±SD)	Males (Mean ±SD)	P value
Height (cm)	134.65 ±16.54	137.91 ±15.51	0.01*
Weight (kg)	27.54±11.39	28,44±10.93	0.28
BMI (kg/m2)	14.45±3.09	14.38±2.97	0.76
BSA (m2)	1.02 ±0.27	1.05 ±0.25	0.12
Chest circumference (inspiration) (cm)	27.21±3.83	27.68±4.23	0.13
Chest circumference (expiration) (cm)	25.67±3.45	26.14 ±3.98	0.09
Arm span (cm)	55.11±7.46	54.81±6.74	0.57

(*P<0.05 Statistically Significant)

Table 1 shows anthropometric measures among male and females subjects. It was observed that mean weight, BMI, Body surface area, chest circumference (in inspiration and expiration) and arm span had no statistical significance among male and females. (P>0.05)

Table 2: Pulmonary Function Test characteristics among subjects:

PFT Characteristics	Females (Mean ±SD)	Males (Mean ±SD)	P value
FVC	1.44±0.61	1.72 ±0.69	<0.0001*
FEV1	1.21±0.60	1.49 ±0.66	<0.0001*
FEV1 %	82.11±19.68	85.20 ±17.69	<0.02*
PEFR	1.97±1.08	2.50 ±1.29	<0.0001*

(*P<0.05 Statistically Significant)

The PFT characteristics showed in table 2 showed FVC , FEV1 ,

FEV1% and PEFR was lower in females as compared to males with statistical significance. (P<0.05)

Table 3: Relationship of FVC, FEV1, FEV1% and PEFR with anthropometric parameters among males and females:

Anthropometric parameters/ pulmonary parameters	r value (Females)				r value (males)			
	Fvc	Fev1	Fev1 %	Pefr	Fvc	Fev1	Fev1 %	Pefr
Age	0.84	0.84	0.34	0.75	0.85	0.85	0.18	0.05
Height	0.83	0.82	0.32	0.73	0.91	0.90	0.18	0.05
Weight	0.66	0.67	0.34	0.59	0.57	0.59	0.22	0.12
Body mass index	1	0.93	0.25	0.82	1	0.95	0.11	0.53
Body surface area	0.86	0.86	0.22	0.06	0.88	0.21	0.08	0.12
Chest circumference (inspiration)	0.84	0.81	0.30	0.72	0.82	0.82	0.16	0.07
Chest circumference (expiration)	0.89	0.87	0.33	0.77	0.91	0.90	0.18	0.05
Arm span	0.88	0.85	0.32	0.76	0.83	0.82	0.16	0.06

("r" is Pearson's correlation coefficient)

Table 3 shows relationship of pulmonary parameters with anthropometric parameters in male and female subjects. Among the pulmonary parameters FVC and FEV1 show the significant positive correlation with age, height, BMI, BSA, CC(inspiration), CC (expiration) and arm span. Among the anthropometric parameters BMI and CC(expiration) and Arm span is showing strong positive correlation with FVC and FEV1.

DISCUSSION:
The purpose of this study was to derive normative standard for pulmonary functions in the school children aged 7-15 years residing in central India and to calculate prediction equation as well as to elucidate the correlation of pulmonary function tests (PFTs) with some anthropometric parameters. Among 700 subjects, 351 () were male and 349 () were female with no statistical significance in relation to age and sex. (P>0.05)

All the anthropometric values and pulmonary parameter values are found to be higher in males as compared to females. Higher anthropometric and pulmonary parameter values in male as compared to female were also observed by Deshpande, J.N. et al[9] and Sandeep budhiraja et al.[10]

In present study we observed significant correlation (p<0.001) between FEV1% and anthropometric parameters and FEV1% values are more in males as compared to females. Similarly, PEFR was having significant positive correlation (P<0.01) with all the anthropometric parameters like age, weight, height, chest circumference, BSA and arm span and PEFR values are found to be lower in female as compared to male.

In a study by P P Sharma et al,[11] they found that FVC / FEV1 values are more in males as compared to females which coincides with the present study. Tahera et al[12] found negative correlation of FEV1% with age and height in both sexes and Howard Eigen et al[13] found negative correlation with height which is in contrast with the present study. Our findings were in accordance with study by Deshpande JN et al,[9] Chowgule RV et al,[5] who found correlation of PEFR with anthropometric parameters.

Boys have better PFT values as compared to girls, the likely physiological explanation for this may be better height and physical performance in boys.[14] Smaller body growth rate and smaller body size is observed in girls. Body size influences lung size, hence taller individual irrespective of age has larger VC indicating they have larger lung volume. Physical training during growth helps in increasing endurance in respiratory muscle, thereby increasing lung capacity.[15] There is abrupt increase in PFT values at adolescence probably due to association of adolescence with increase rate of growth and other profound changes including increased rate of pulmonary physiological development.[16]

The study includes only urban children and lacks the data on rural children which was main limitation of the study.

CONCLUSION: There is significant correlation between pulmonary function parameters and anthropometric parameters.

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