Pulmonary Function in Young Bengalee Females of Sedentary Occupations: Influence of Select Anthropometric Variables on It

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ABSTRACT

Assessment of pulmonary function, a non invasive test, used to detect air flow limitation and/or lung volume restriction, remains an important parameter in pre employment and periodic medical examinations in many occupations. For various constrain, it has been made a statutory compulsion in only few industrial activities in India. But it is no less important in other avocations, even that of sedentary nature, particularly in view of the fact that many human resources of sedentary occupations are nowadays required to spend a major part of their daily working time in poorly ventilated very small, partitioned cubicles. The situation aggravates further when the partitioning is done with chemically treated insect resistant ply boards. In this backdrop a study was conducted on young sedentary females to assess the status of pulmonary function and to find out and/or validate relationship, if any, existing between pulmonary function as manifest in lung function tests in terms of FVC, FEV_1 and anthropometric variables particularly leg height, trunk height, shoulder height, and arm span. Body height (cm) and body weight (kg) along with the anthropometric parameters leg height, trunk height, shoulder height, arm span were measured. Pulmonary function test procedures were carried out on 39 females volunteers (age range 24-30 year) using Jaeger Flowscreen Pro in morning hours, following the recommendation of American Thorasic Society (ATS). Arm span and body height were found to have significant ($P<0.05$) positive correlation with FVC and FEV_1. Shoulder height and trunk height were also significantly ($P<0.05$) correlated with FVC and FEV_1.

Key words: indoor air pollution, anthropometry, PFT, validation study, pre employment medical examination, periodic medical examination

INTRODUCTION

Lung volume measurement has immense role in pulmonary assessment both in health and in disease condition. It is important in providing information about severe respiratory abnormality, particularly for diseases that are associated with air flow limitation, air-trapping and restrictive changes of the lung[1]. Pulmonary function test, a non invasive test, use inter alia to detect air flow limitation and/or lung volume restriction. Pulmonary function test is therefore an important parameter used in pre employment and periodic medical examinations in many occupations and it has been made a statutory compulsion in industrial activities in India. Moreover many human resources of sedentary occupations are nowadays required to spend a major part of their daily working time in poorly ventilated, very small, partitioned cubicles. The situations worsen if chemically treated insect resistant ply boards are used. In addition, air pollution and smoking results in lung diseases (e.g. COPD) and occupational pulmonary diseases and thus increasing the importance of lung function assessment in recent times. Early detection of functional impairment and its appropriate treatment will help to reduce morbidity and mortality due to these diseases[2]. In this backdrop a study was conducted on young sedentary females to assess the status of pulmonary function and to find out and/or validate relationship, if any, existing between pulmonary function as manifest in lung function tests in terms of FVC, FEV_1 and anthropometric variables particularly leg height, trunk height, shoulder height, and arm span.

MATERIALS AND METHODS

The study was conducted on 39 females randomly chosen adult subjects, mostly residing in and around Kolkata, the capital of Indian province West Bengal, aged between 24-30 years. Initially organizational consent was taken. Then individuals were approached for preliminary consent for participation in the study. Those, who showed some interest, were explained the study requirements in details. The names of consenting individuals were enlisted. On the scheduled date of mutual convenience, measurements were obtained. The measurements were carried out in morning hours. The age (years), information about duration of different daily activities, preliminary socio-economic data were recorded in pre-designed schedules. Individuals having any history of personal or familial (self-reported) lung problem and smokers were excluded. Only non-smoker individuals were included in the study. Basic anthropometric parameters like body height (to the nearest accuracy of 0.5 cm) using an anthropometric rod, and body weight (to the nearest accuracy of 0.1 kg) using a pre calibrated weighing scale, were recorded, with subjects in light clothing and without shoes. Leg height, shoulder height (the distance between the acromion landmark on the tip of the right shoulder and the base of the standing surface), trunk height (the height of the suprasternale above the sitting surface) and arm span (the perpendicular distance between the middle dactylia on the left and right arms outstretched horizontally)[3] were measured. After completing the anthropometric measurements, subjects were asked to take rest for at least a period of 15 minutes and then the volunteers were familiarized with the lung function test procedure, as recommended by the American Thoracic Society[4]. Lung function test was carried out by Jaeger Flowscreen pro (Version: 6). Subjects were performed at least three trials and reproducible two were accepted, as per recommendations of ATS. After each trial a check is made according to the ATS criteria. After appropriate placement of mouthpiece attached to the pneumotach and nose clip, each subject was asked to breathe quite normally via the pneumotach. After normal breathing, the subject exhales out deeply followed by maximum inspiration and maximum expiration. Spirometric variables like forced vital capacity (FVC), forced expiratory volume in 1st second (FEV_1) were measured and obtained values are expressed in BTPS[5].

RESULTS

Table 1: Basic Profile

Sample Size (n)	39
Age (year)	26.4 ± 1.44
Body Height (cm)	158.8 ± 6.12
Body Weight (kg)	60.6 ± 10.38
BMI ($kg.m^{-2}$)	24.1 ± 4.48

Values are in AM ± SD

Table 2: Anthropometric and Lung function variables values

Variables	Values
Anthropometric Variables	
Body Height (cm)	158.8 ± 6.12
Shoulder Height (cm)	130.2 ± 9.56
Trunk Height (cm)	35.5 ± 7.59
Leg Height (cm)	95.0 ± 5.63
Arm Span(cm)	157.8 ± 6.07
Lung function Variables	
FVC- Forced Vital Capacity (l)	2.5 ± 0.48
FEV_1- Forced Expiratory Volume in first second ($l.min^{-1}$)	1.9 ± 0.42

Values are in AM ± SD

Table 3: Matrix of correlation coefficients obtained between anthropometric and lung function variables

	Body Height (cm)	Shoulder Height (cm)	Trunk Height (cm)	Leg Height (cm)	Arm Span (cm)	BMI ($kg.m^{-2}$)	FVC (l)	FEV_1 ($l.min^{-1}$)
Body Height (cm)	1.0	0.80**	0.39*	0.82**	0.98**	0.42*	0.47**	0.45**
Shoulder Height (cm)		1.0	0.80**	0.58**	0.79**	0.43*	0.53**	0.41**
Trunk Height (cm)			1.0	0.02^	0.36*	0.28^	0.55**	0.36*
Leg Height (cm)				1.0	0.84**	0.34^	0.26^	0.44**
Arm Span (cm)					1.0	0.42*	0.42**	0.45**
Body Mass Index ($kg.m^{-2}$)						1.0	0.40*	0.33^
FVC (l)							1.0	0.57**
FEV_1 ($l.min^{-1}$)								1.0

* P<0.05, ** P < 0.01, ^ ns

The magnitude of correlation between anthropometric and lung function variables has been graphically presented in Fig 1.

Table 4: The relationship between anthropometric and lung function variables and the regression models on the relationship

Anthropometric variables (Predictor)	Lung Function Variables (Criterion)	Correlation coefficient(r)	Regression equations
Body Height in cm (X_1)	FVC(Y_1)	0.47**	$\hat{Y}_{11} = -3.262 + 0.035X_1$
	FEV_1(Y_2)	0.45**	$\hat{Y}_{12} = -3.007 + 0.030X_1$
Shoulder Height in cm(X_2)	FVC(Y_1)	0.53**	$\hat{Y}_{21} = -1.244 + 0.027X_2$
	FEV_1 (Y_2)	0.41**	$\hat{Y}_{22} = -0.448 + 0.017X_2$
Trunk Height in cm (X_3)	FVC(Y_1)	0.55**	$\hat{Y}_{31} = 1.2 + 0.033 X_3$
	FEV_1 (Y_2)	0.36*	$\hat{Y}_{32} = 1.517 + 0.008X_3$
Leg Height in cm (X_4)	FVC(Y_1)	0.26^	$\hat{Y}_{41} = 0.323 + 0.022X_4$
	FEV_1 (Y_2)	0.44**	$\hat{Y}_{42} = -1.235 + 0.032X_4$
Arm Span in cm (X_5)	FVC(Y_1)	0.42**	$\hat{Y}_{51} = -2.625 + 0.032X_5$
	FEV_1 (Y_2)	0.45**	$\hat{Y}_{52} = -2.927 + 0.03X_5$

* P<0.05, ** P<0.01, ^ns

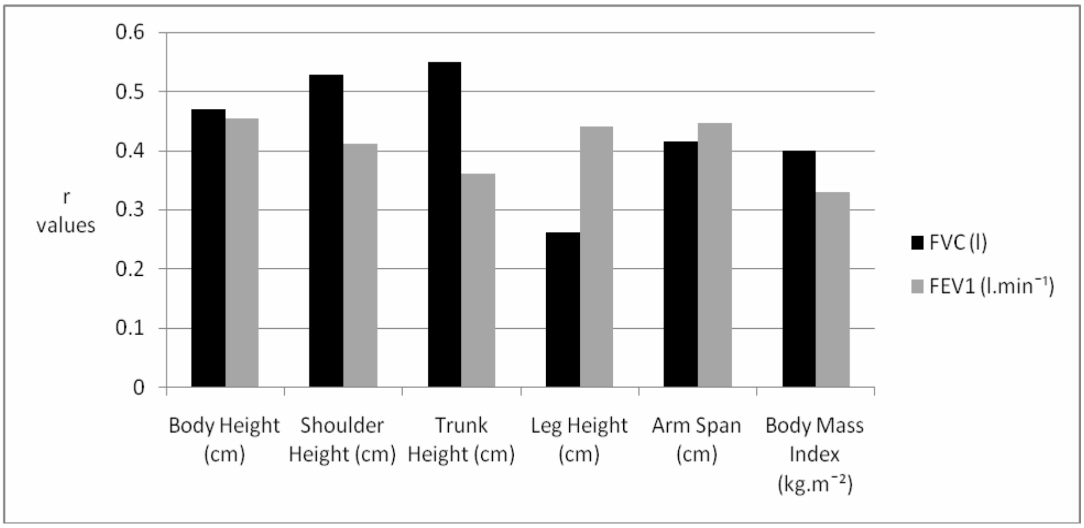

Fig 1: Magnitude of correlation between lung function variables and different anthropometric parameters

DISCUSSION

By performing correlation, body height, shoulder height and trunk height were found to have significant ($P<0.01$) positive correlation with FVC and FEV_1. Leg height and arm span were also significantly ($P<0.01$) correlated with FEV_1. BMI has significant ($P<0.05$) correlation with FVC and anthropometric variables. The computed FEV_1% has been found to be 75.9 indicating that the volunteers are not suffering from obstructive and restrictive lung problems. The observations are in consonance with the findings of Sitarama Raju et al, 2003[6]. They reported that normal, healthy boys aged between 5-15 years show significant correlation between lung function parameters and anthropometric variables. In the present study carried out on Bengalee adult females, similar trend has been obtained.

In the present study, there is a positive correlation between anthropometric variables and LFT. The observations are in agreement with the findings of Pellegrino et al, 2005[7]. They also reported that different body dimensions like stature have influence on LFT.

From the present study, it may be concluded that there is a positive correlation between anthropometric variables body height, shoulder height, trunk height, leg height and arm span and lung function variables in Bengalee adult females. The models, on being further validated, could be used for getting an estimate of the likely values of pulmonary function parameters in situations where spirometer with calibration facility is not regularly available.

ACKNOWLEDGEMENTS

The authors of the paper are thankful to the volunteers for participating in the study, to the head of the institutions and to University of Calcutta.

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