



A STUDY TO FIND THE ALTERATION IN THE PULMONARY FUNCTION TESTS IN OBESE INDIVIDUALS AS COMPARED WITH THE NORMAL WEIGHT INDIVIDUALS

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ABSTRACT Obesity will be a significant risk factor for a whole range of cardiorespiratory diseases. This study aimed to find the alteration in the pulmonary functions in overweight and obese individuals as compared with the healthy weight individuals.

Methodology: It is a Hospital-based cross-sectional study done in 140 subjects. Data about pulmonary function tests were collected and analyzed using IBM SPSS statistics 21.0 and presented in percentages, mean, and standard deviation.

Results: PFT variables such as FVC, FEV₁ and PEFR is significantly less in obese subjects than normal BMI subjects and shows a significant positive correlation with BMI in normal BMI subjects, and negative correlation in obese subjects except in FEV₁/FVC.

Conclusions: The findings of the study revealed that all the parameters of lung functions that were studied showed a statistically significant inverse relationship with an increase in BMI.

KEYWORDS : Pulmonary function tests, Obesity, Comparative study.

INTRODUCTION:

Obesity is a global phenomenon that increases morbidity and reduces life expectancy. Body mass index (BMI) calculated by weight (in kilograms) divided by the square of the height (in meters) is a commonly used measure of adiposity because it is readily measurable and correlates with adverse outcomes such as vascular disease and the development of diabetes mellitus.¹ Obesity has become so prevalent in both developed and developing nations, and presently it replaces the infectious diseases and undernutrition as the most significant contributor to ill health.²

Globally, it is assumed that more than 1 billion overweight adults, and at least 300 million of them are obese.³ In developed countries, obesity is found more in lower socioeconomic groups, while in developing countries, obesity is more prevalent in affluent class.⁴ Several factors are contributing to overweight. Such as genetic factors, lifestyle disorders, endocrine problems, genetic syndromes, and medications.⁵ Obesity will be a significant risk factor for a whole range of cardiorespiratory diseases.⁶ Obesity will alter the pulmonary functions and diminish exercise capacity by the adverse effects on the respiratory mechanism, respiratory muscle function, lung volumes, work, and energy cost of breathing and gas exchange.⁷

Thus, obesity has a direct effect on the mechanical function of the respiratory system by altering airway caliber, lung volumes, or respiratory muscle strength.⁸ This study aimed to find the alteration in the pulmonary functions in overweight and obese individuals as compared with the healthy weight individuals (based on World Health Organization criteria for Body Mass Index).

METHODOLOGY:

It is a Hospital-based cross-sectional comparative study done in Patients attending OPD and IPD of the General Medicine department in the hospital attached to the PES institute of medical sciences and research (PESIMSR), Kuppam from June 2019 to November 2019. A sample of 140 subjects selected by simple random sampling, which includes 70 healthy weight (18.5-22.9 kg/m²) and 70 obese adults (≥25 kg/m²), categorized based on new BMI criteria for Asians by the regional office for the western pacific region of WHO. Calculation of sample size by assuming a confidence interval of 95%, power of 80% with a population variance of 110 based on previous studies, and a hypothesized difference of 5.⁹ Institutional ethical committee permission and informed consent from the patients obtained before the start of the study. Data was collected using a pre-designed semi-structured questionnaire, which contains questions about demographic information of the patients like age and gender and anthropometric measurements like height, weight, and BMI and also about pulmonary function tests like FVC, FEV₁, FEV₁/FVC ratio, and PEFR. Data

entered into Microsoft Excel and analyzed using IBM SPSS statistics 21.0. Categorical variables are presented in percentages, and continuous variables are presented in mean and standard deviation and the association between continuous variables was analyzed using Student t-test (two-tailed, independent).

RESULTS:

A total of 140 subjects included, of which 70 subjects have normal BMI, and another 70 subjects are obese. The mean age of the subjects with normal BMI is 22.3±3.04 years and obese is 23.1±2.85 years. The mean BMI value of the subjects in the normal BMI category is 20.8±1.43 kg/m² and the obese category is 27±1.22 kg/m². Comparison of the pulmonary function tests (PFT) variables like Forced vital capacity (FVC), Forced expiratory volume in 1st second (FEV₁), FEV₁/FVC% and Peak expiratory flow rate (PEFR) between normal BMI and obese subjects are presented in table 1. PFT variables such as FVC, FEV₁ and PEFR is significantly less in obese subjects than normal BMI subjects. Correlation of the spirometric parameters with BMI in normal BMI and obese subjects is presented in table 2, which shows all the parameters except FVC in normal BMI subjects have a positive correlation with BMI and in obese subjects except FEV₁/FVC, all other parameters showing a negative correlation. Correlation of BMI with PEFR in obese subjects is presented in figure 1, showing a significant negative correlation with BMI. (p<0.05)

Table 1: Mean values of PFT variables in Normal and Obese subjects

Pulmonary function tests (PFT)	Normal BMI subjects		Obese subjects		p-value
	Mean	SD	Mean	SD	
FVC (liters)	2.91	0.46	2.71	0.37	0.005; S
FEV1 (liters)	2.48	0.65	2.30	0.32	0.040; S
FEV1/FVC %	84.6	14.1	88.7	5.46	0.025; S
PEFR (liters/min)	412.4	68.7	331.4	80.1	< 0.001

Table 2: Correlation of Spirometric parameters with BMI in two groups

Correlation of BMI with		Pearson correlation coefficient (r)	p-value
Healthy BMI subjects	FVC	-0.031	0.801; NS
	FEV1	0.028	0.820; NS
	FEV1/FVC	0.119	0.325; NS
	PERF	0.049	0.687; NS
Obese subjects	FVC	-0.142	0.241; NS
	FEV1	-0.081	0.506; NS
	FEV1/FVC	0.039	0.752; NS
	PERF	-0.275	0.021; S

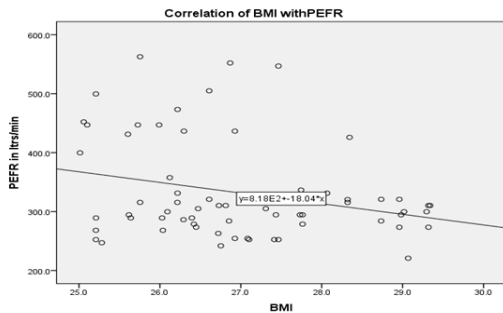


Figure 1: Correlation of BMI with PEFR in obese subjects

DISCUSSION:

Out of 140 subjects, 70 subjects each are normal BMI subjects and obese subjects included to assess in the alteration of pulmonary function tests with body mass index. It is showing that FVC, FEV₁ and PEFR are reduced, and FEV₁/FVC is increased significantly in obese subjects than normal BMI subjects. ($p < 0.05$) It is similar to the findings of the study done by Nandhini Chandrasekhar et al.,⁹ Bemat Ilyas Yaqub et al¹⁰ and Narasimhaswamy K.N et al.¹¹ On assessing the association of BMI on pulmonary function tests using the Pearson coefficient, it is showing that in healthy BMI subjects, all the parameters except FVC showing a positive correlation and in obese subjects, except FEV₁/FVC all other parameters showing a negative correlation. It is partially contradictory to the study done by Joyashree Banerjee et al¹² that in healthy subjects that FVC and FEV₁ were reported to show a negative correlation with BMI. The difference might be occurred due to the difference in the age group of the subjects, their gender, and mean anthropometric variations.

CONCLUSIONS:

The findings of the study revealed that all the parameters of lung functions that were studied showed a statistically significant inverse relationship with the increase in BMI. It indicates a rise in the body mass index alters pulmonary functions in a restrictive pattern, which may give rise to long term complications and is associated with early mortality and morbidity.

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