



A COMPARATIVE STUDY OF PULMONARY FUNCTION TESTS AND BODY MASS INDEX IN YOUNG ADULTS

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ABSTRACT

Background: Overweight and obesity nowadays have become a global concern in developed and developing countries. Obesity is a disorder involving excessive body fat that increases the risk of metabolic syndrome. **Aims and Objectives:** The purpose of this study was to observe the effect of increase in body mass index on dynamic pulmonary function parameters like FVC, FEV1 and PEFR in the young adult male population of Ahmedabad. **Material & Methods:** The study was undertaken to assess few pulmonary function test parameters in normal weight and overweight young adult males of Ahmedabad. The study and the control groups were comprised of 30 subjects each matched for age, sex and socioeconomic status, randomly selected from the population of Ahmedabad. Device used was spiroexcel digital spirometer by Medicaid system at Physiology Department of B.J. Medical College Ahmedabad. FVC, FEV1 and PEFR were used as measures of lung functions. **Result and Conclusion:** There were significant differences in FVC, FEV1 and PEFR in the study group ($p < 0.05$). There was inverse relationship between pulmonary function parameters and an increase in BMI. These data demonstrate that pulmonary function test parameters of overweight young adults were significantly reduced when compared to the normal weight counterparts. An increase in BMI had a significant effect on spirometric measurements in young adult males of Ahmedabad.

KEYWORDS : Body Mass Index (BMI), Spirometry, Pulmonary Function Tests, FVC; FEV1; PEFR.

INTRODUCTION

The term Obesity has been derived from the Latin word *Abesitas* which means "stout, fat or plum". It is defined as disorder involving excessive body fat that increases the risk of health problems.

Overweight and obesity are the fifth leading cause of global death and may soon replace traditional public health issues like malnutrition and infectious diseases as predicted by WHO¹. Barry M. Popkin and his colleague mentioned in their study that we now face the emergence of obesity as a worldwide phenomenon affecting under developed and developing countries².

If a person weighs more than the set range of ideal weight which is considered healthy for a particular height, he is said to be overweight or obese³. The most commonly used method of measuring and identifying obesity is Body Mass Index (BMI) or Quetelet index. It is weight of a person in kilograms divided by the height in meters squared (kg/m^2).

BMI (Kg/m ²)	Status
< 18.5	Underweight
18.5-24.9	Health Weight
25-29.9	Pre obesity or Overweight
30-34.9	Obesity class 1
35-39.9	Obesity class 2
40 Or Above	Obesity class 3

Reduced workout throughout the day, sluggish life style, over eating of high caloric food and genetic factors increase the risk of overweight and eventually obesity to manifolds. Several Studies have observed the relation between obesity and lung function using BMI as a measure of overall adiposity⁴.

Obesity, owing to its fat deposition compromises the lung

functions in a number of ways that includes. (1) decrease in chest wall and lung compliance. (2) increased resistance within the respiratory system. (3) increase in the work and energy cost of breathing as a result of reduced muscle strength and endurance. (4) overall hampering the pulmonary ventilation and pulmonary diffusion.

Spirometry refers to recording of volume changes during various clearly defined breathing maneuvers. It is employed to study the pulmonary function and is considered to be the initial screening tool for pulmonary diseases.

The purpose of this study was to record and compare the pulmonary function test parameters in normal weight and overweight young adult males and also to study the effect of increase in BMI on this parameters.

MATERIAL AND METHOD

This is a case control study in which pulmonary function test was performed on 60 young adult males between 18-25 years of age. These subjects were divided in two groups, which include 30 overweight (25-29.9 kg/m^2), taken as a study group compared with 30 Normal weight (18.5-24.9 kg/m^2) healthy Controls in the same age group.

Random sampling method was used to select subjects from general population of Ahmedabad. Instrument used was spiroexcel digital spirometer by Medicaid system at Physiology Department of B.J. Medical College Ahmedabad.

Healthy subjects of required age group, placed within a normal and overweight WHO BMI classification and who had given written consent after prior explanation of the procedure in their local language were included for the study, whereas Individuals with physical deformity of chest wall and those with recent upper or lower respiratory infections were put in

exclusion criteria.

After ethical approval of the institution committee, consent was also sought from each and every subject of the study. Basic parameters of subject like age, weight and height were recorded to obtain the predicted values in spirometry. The subjects were made comfortable after explaining the procedure in their local language. Pulmonary function test was performed in sitting posture facing opposite to the PFT monitor. Spirometry was done using spirometer three times and best of the three value was considered. Like this flow volume loop and volume time curve was obtained for each and every subject.

Statistical analysis: Student "t" test was used to find the difference in spirometric parameters between healthy control and overweight individuals. P value <0.05 was considered significant.

RESULT

Variables recorded were: - Forced vital capacity (FVC), Forced expiratory volume during first second (FEV₁), FEV₁/FVC Ratio, Peak expiratory flow rate (PEFR).

PARAMETER	STUDY GROUP (N=30) MEAN±SD (BMI>25-29.9)	CONTROL GROUP (N=30) MEAN±SD (BMI 18.5-24.99)	P VALUE	RESULT
FVC (%)	02.71±0.43	02.98±00.55	0.0007	Significant
FEV1 (%)	02.45±00.49	02.62±00.61	0.0001	Significant
FEV1/FVC (%)	90.33±08.01	87.79±11.91	0.0009	Significant
PEFR (lts/min)	343.62±94.99	408.28±78.24	0.0002	Significant

DISCUSSION

The present study found that FVC was significantly reduced in overweight (mean±SD 02.71±0.43) when compared to normal subjects (mean±SD 02.98±0.55) and there was negative correlation of BMI with FVC in overweight subjects. My study was in tune with the study done by Chen Yue et al⁵, who saw negative correlation of BMI with FVC in overweight and obese subjects when compared to normal subjects. They reasoned the mechanical pressure on the diaphragm to be the major cause of this association.

Deposition and accumulation of fat on the abdomen during obesity impair the descent of diaphragm during inspiration which would affect several spirometric variables, this was well observed and stated in the study conducted by Rebekah M steele⁶.

We noticed statistical significant changes in FEV₁ parameter, similar to the findings of Shashi Mahajan et al⁷. Our result showed negative correlation of BMI with PEFR with statistical significant value of less than 0.05.

Vertical diameter of thoracic cavity is reduced due to compression by fat which also impair the diaphragmatic movements. These changes hamper the lung compliance and alter the lung volumes and flow rates especially PEFR⁸.

CONCLUSIONS

The result of the present study suggest that obese individuals though appearing asymptomatic are high risk individual for other systemic disorders like cardio vascular disease (Hypertension), Metabolic Disease (DM) and Respiratory Diseases. Hence they should be encouraged for weight reduction and regular exercise to improve the lung function and general fitness.

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