

Original Research

Body Mass Index (BMI) – An indicator for obstructive lung Disease?

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ABSTRACT:

Background: Obesity measured by BMI results in decreasing the lung volume and its capacities by affecting both lung and chest wall compliance and may lead to obstructive lung disease. Pulmonary function tests, specially FEV1/FVC can easily detect the obstructive lung disease. **Aim:** Evaluation of any correlation between BMI, FEV1, FVC and FEV1/FVC in young subjects. **Methods & Materials:** A total of 150 M.B.B.S first year students between the age group of 17 to 25 years and without a history of smoking, family history of hypertension, diabetes mellitus and tuberculosis were taken for the study. BMI of all subjects was calculated by measuring weight and height and then divided in to three groups as underweight, normal weight and overweight. Pulmonary function tests were performed in all subjects to evaluate FEV1, FVC and FEV1/FVC. Finally all these parameters were analysed to find any correlation. **Statistical analysis used;** The data was analyzed by using the SPSS version 10 [Statistical Package for Social Sciences] statistical software, ANOVA correlations and Pearson Correlation Coefficient (r value). **Results:** There was a significant difference between the BMI, FVC, FEV1 and FEV1/FVC values across the three groups. In the overweight group, BMI showed a significant negative correlation with the FVC, FEV1 and the FEV1/FVC although a weakly positive correlation was found in underweight and normal weight group. **Conclusion:** BMI was found to inversely correlated with FVC, FEV1 and the FEV1/FVC which implies that obesity was associated with decrease in pulmonary functions and thus BMI can be used as an indicator of obstructive lung disease.

Keywords: BMI, FVC, FEV1, FEV1/FVC, Obstructive lung disease

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INTRODUCTION:

Obesity is one of the leading problems prevalent in india. In young adults the main cause of obesity is sedentary life style and wrong eating habits like junk food. BMI is a considered as most significant factor in diagnosis of overweight and obesity in clinical fields.[1] Obesity affects almost all the organs of body majorly cardio vascular system, Diabetes, Osteo arthritis, but respiratory problems are given less attention. Obese people usually represents with breathlessness especially during any physical exercise, at rest they may appear normal. The frequency of obesity results in decreasing the lung volume and its capacities by affecting both lung and chest wall compliance.(2)Pulmonary function test can easily detect the obstructive lung disease. FEV1/FVC is most reliable factor to study about any obstructive lung disease.

Various studies have been done, which have shown the effect of severe and morbid obesity on the pulmonary functions [3,4,5,6]. Very few studies have been focused on the effect of moderate weight gain on the pulmonary functions [6,7]. So in present study we are going to compare 3 parameters normal weight, under-weight and over-weight with FEV1/FVC ratio.

MATERIAL AND METHODS:

The present study was conducted in Maharishi Markandeshwar Medical College, Solan, Himachal Pradesh, India, after taking approval from the institutional ethical committee. A total of 150 M.B.B.S first year students between the age group of 17 to 25 years were taken for the study and informed consent was taken from the volunteers. Students with a history of smoking, family history of hypertension, diabetes

mellitus and tuberculosis were not included in the study.

For this study equipment used were Spiro Excel (Medicaid systems), Weighing scale, and Flexible metallic tape. Body mass index [BMI] was calculated by using Quetlet’s index [body weight in kg/height in m²] after recording measurements such as weight (kg) and height (m). [8]

According to BMI, the subjects were divided in to 3 groups:

Underweight – BMI <18.5kg/m²

Normal weight - BMI 18.5-24.9kg/m²

Overweight– BMI >25 kg/m²

Pulmonary function tests were assessed by using a computerized spirometer which consists of transducer attached with disposable mouthpiece. To perform the procedure, firstly the subject was made familiar with the working of the instrument, and then the subject was made to sit erect and comfortably facing the spirometer. The subject was asked to inhale deeply and then exhale forcefully with maximum effort into the mouthpiece, by wearing a nose clip. The parameters recorded were - Respiratory rate, FVC (Forced vital capacity), FEV1 (Forced expiratory volume in 1 sec), FEV1/FVC (in %), Forced expiratory flow.

The data were expressed in mean±SD and they were analyzed by using the SPSS version 10 [Statistical Package for Social Sciences] statistical software, ANOVA correlations and Pearson Correlation Coefficient (r value). The significance level was set at p values which were < 0.05 and it was considered as significant.

RESULTS:

BMI was significantly different in the underweight, normal weight and the overweight subjects, [p <

0.00001]. There was a significant difference between the FVC, FEV1 and FEV1/FVC values across the three groups.

DISCUSSION:

This study was conducted to see the correlation of underweight, normal weight and over weight adults with the FEV1, FVC and FEV1/FVC. This study was an attempt to find that weather the young adults with increased BMI are at risk of early development of obstructive lung disease. Pulmonary function tests are generally related to body size and age, where height is a proxy for chest size, and age reflects maturity.[9] for this reason every individual has different range of normal values for PFT.

Our study shows negative co relation between over weight subjects and FVC The result of the present study was consistent with the study done by Chen Yue et al[10], who observed negative correlation of BMI with FVC in overweight and obese subjects when compared to normal subjects. They also stated that intra abdominal pressure that has a mechanical effect on the diaphragm is suspected of being a major reason for the association of obesity with lung dysfunction. Similar findings were also seen in study done by Anuradha R. Joshi et al[11], Shashi Mahajan et al[12] and Nibedita Priyadarsini[13].

There was negative correlation of BMI with FEV1 in obese subjects. These findings tuned with the study done by Shashi Mahajan et al[12], Dayananda G et al[14] and Nibedita Priyadarsini et al[13] . Decreased FVC and FEV1 may be because of fat accumulation around ribs, abdomen and diaphragm which causes restricted movements of ribs, reducing lung volume and decreasing respiratory compliance.[15].

Table 1: BMI, FEV1, FVC and FEV1/FVC in three groups

Group	Under weight (BMI<18.5) (n=24)	Normal weight (BMI=18.5-24.9) (n=88)	Over weight (BMI>25) (n=33)	F value	P value (<0.05 significant)
	Mean±SD	Mean±SD	Mean±SD		
BMI	17.37±0.86	21.30±1.65	28.64±4.32	166.45042	0.00001
FEV1	3.50±0.56	3.66±0.60	3.92±0.61	3.80461	0.024571
FVC	2.65±0.47	2.99±0.61	3.20±0.61	5.97826	0.003215
FEV1/FVC	93.59±5.28	92.25±4.63	90.00±5.19	4.20997	0.016741

In the underweight and normal weight groups, there was a positive correlation between BMI and FEV1, FVC & FEV1/FVC although the relation was very weak. On the other hand in the overweight group, BMI showed a significant negative correlation with the FVC, FEV1 and the FEV1/FVC.

Table 2: Correlation between BMI, FEV1, FVC and FEV1/FVC

Correlation between	r value		
	Under weight (BMI<18.5) (n=24)	Normal weight (BMI=18.5-24.9) (n=88)	Over weight (BMI>25) (n=33)
BMI & FEV1	0.0837	0.1037	-0.3879
BMI & FVC	0.1277	0.0647	-0.2804
BMI & FEV1/FVC	0.0336	0.0515	-0.1768

In our study there is strong negative co relation between obese subjects and FEV1/FVC which was not seen in the study conducted by Shashi Mahajan et al[12].

In present study there was a very weak positive co relation between BMI and pulmonary function test in under weight and normal weight subjects suggesting that over weight or obesity may carry a risk of obstructive lung disease.

CONCLUSION:

BMI was found to be inversely correlated with FVC, FEV1 and FEV1/FVC in overweight subjects which implies that obesity is associated with decrease in pulmonary functions and thus BMI can be used as an indicator of Obstructive lung disease.

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