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Original Research Article

The Effect of Body Mass Index on Pulmonary Function Tests in Young Adults

Tarun Kumar[1], Savita[2], Bipin Kumar[3], Rita Kumari[4]

[1]3rd year Junior Resident, Department of Physiology, Nalanda Medical College & Hospital, Patna, Bihar, India

[2]Tutor, Department of Physiology, Nalanda Medical College & Hospital, Patna, Bihar, India

[3]Associate Professor, Department of PSM, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India

[4]Professor & HOD, Department of Physiology, Nalanda Medical College & Hospital, Patna, Bihar, India

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Corresponding Author: Savita

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Abstract:

Background: Lung function parameters are linked to body mass index (BMI), which is a frequent predictor of overweight and obesity as well as body size. The simplest test for diagnosing lung disease is the pulmonary function test.

Objective: To study the association of BMI and pulmonary function.

Material and Methods: 110 participants in the 18–22 age range participated in the current cross-sectional prospective study, which was carried out in Nalanda medical college and hospital, Bihar. Participants having a history of smoking, cardiovascular diseases, bronchial asthma, restrictive lung diseases, or other respiratory conditions were not allowed to participate in the study. The Medical College's Ethical Committee gave its approval to the project. PFT, anthropometry, and the subject's demographic profile were among the data. The resulting data was tallied and statistical analysis was performed.

Results: Participants who were obese showed noticeably lower FVC and FEV_1 than those with normal BMI. In all BMI categories, the FEV_1/FVC ratio stayed within normal bounds, indicating a primarily restrictive pattern of lung damage in those with higher BMIs.

Conclusion: Compared to individuals with a normal BMI, those who are underweight or obese have worse lung function measures. Fostering the best potential respiratory health may depend on maintaining a healthy body mass index (BMI) through regular exercise and a well-balanced diet.

Keyword: BMI, Pulmonary Function test, Cross sectional, Obesity, exercise.

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Introduction

One commonly used measure of nutritional status and body fat composition is body mass index, or BMI [1]. Lung function and respiratory mechanics are known to be impacted by both obesity and undernutrition [2]. While underweight people may have weaker respiratory muscles, obese people may have decreased chest wall compliance, increased airway resistance, and altered respiratory muscle function [3]. An objective evaluation of lung volumes and airflow is provided by pulmonary function tests (PFTs), which are helpful in determining how BMI affects respiratory health. Given the increasing incidence of obesity in young adults, it is critical to comprehend how it affects pulmonary function in order to detect respiratory compromise early [4]. The purpose of this study was to assess the association between young individuals' BMI and pulmonary function metrics.

Methods

Study Duration: The study was conducted over a period of 10 months in Nalanda medical college and hospital, Bihar.

Participants: A total of 110 participants were selected for this study.

Study type: This cross-sectional observational study.

There were 110 young individuals in good health, ages 18 to 25. Individuals with a history of acute respiratory infections, spinal abnormalities, respiratory or cardiovascular diseases, or smoking were not allowed to participate. BMI was computed by dividing weight (kg) by height squared (m2), using anthropometric data such as height and weight. Based on the World Health Organization's

(WHO) BMI classification, participants were divided into four groups: underweight, normal weight, overweight, and obese. A computerised spirometer was used to conduct pulmonary function testing in accordance with American Thoracic Society (ATS) standards. Peak expiratory flow rate (PEFR), forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), and the FEV_1/FVC ratio were among the parameters evaluated. Out of three suitable manoeuvres, the best one was noted. A p-value of less than 0.05 was deemed statistically significant after the data were examined using the proper statistical tests.

Results

There were 110 participants in the study, with a nearly equal number of men and women. Those with a normal BMI made up the largest group. The normal BMI group had the greatest mean FVC, FEV_1, and PEFR values, which also exhibited a decreasing trend as BMI increased.

Participants who were obese showed noticeably lower FVC and FEV_1 than those with normal BMI. In all BMI categories, the FEV_1/FVC ratio stayed within normal bounds, indicating a primarily restrictive pattern of lung damage in those with higher BMIs. Although the decrease was less noticeable than in the obese group, underweight participants also had lower PFT values than those with normal BMIs.

Table 1: Distribution of Study Participants According to BMI Category (n = 110)

BMI category (kg/m²)	Number (n)	Percentage (%)
Underweight (<18.5)	22	20
Normal (18.5–24.9)	35	31.8
Overweight (25–29.9)	30	27.2
Obese (≥30)	23	21
Total	110	100

Table 2: Comparison of Pulmonary Function Parameters Across BMI Categories (Mean ± SD)

Parameter	Underweight (n=30)	Normal (n=92)	Overweight (n=48)	Obese (n=30)	p-value
FVC (L)	3.22 ± 0.42	3.45 ± 0.42	3.48 ± 0.42	2.58 ± 0.30	<0.001
FEV_1 (L)	2.86 ± 0.38	3.42 ± 0.43	2.75 ± 0.45	2.44 ± 0.38	<0.001
FEV_1/FVC (%)	82.4 ± 5.6	80.2 ± 4.4	85.1 ± 5.5	82.6 ± 3.9	<0.05
PEFR (L/s)	5.4 ± 1.1	6.6 ± 1.3	6.3 ± 1.2	7.1 ± 1.0	<0.05

Statistical test: One-way ANOVA
$p < 0.05$ considered statistically significant

Discussion

The goal of the current cross-sectional prospective study was to investigate the relationship between pulmonary function and BMI. 110 participants in the 18–22 age range who provided written consent were added to the research. Thirty-eight percent of the individuals were normal. 27.2% of the 110 participants were overweight. Lung function tests for male and female participants were compared. The results of this study show a strong correlation between young people BMI and lung function. Increased fat deposition over the thoracic and abdominal areas, which results in poorer chest wall compliance and diaphragmatic mobility, may be the cause of the reduced lung capacities seen in overweight and obese people. A restrictive rather than an obstructive ventilatory problem is suggested by the maintenance of the FEV_1/FVC ratio [5]. There is a strong inverse association between BMI and lung volumes, as seen by the statistically significant decrease in FVC, FEV_1, and PEFR among patients who were overweight or obese ($p < 0.001$). Although it was less pronounced than in obesity, underweight people still showed decreased pulmonary function when compared to persons with normal BMIs [6]. These results are in line with other research that links decreased lung function in underweight people to weakened respiratory muscles and mechanical constriction of the thoracic cage and diaphragmatic excursion in obese people. Reduced respiratory muscle strength and inadequate lung growth may be the cause of the poorer pulmonary function values seen in underweight people. Previous research has shown similar patterns, supporting the idea that lung function is negatively impacted by both BMI extremes [7]. Early lifestyle changes that maintain an ideal body mass index (BMI) may assist young individuals maintain their respiratory health.

Conclusion

Young adults pulmonary function tests are significantly impacted by their BMI. Lung function parameters are lower in underweight and obese people than in people with a normal BMI. Maintaining a healthy body mass index (BMI) through consistent exercise and a well-balanced diet may be essential for fostering the best possible respiratory health. To investigate the long-term impacts of BMI on lung health, more longitudinal research is advised.

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