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# A Comparative study of pulmonary function tests in normal and obese subjects

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**Abstract**
Obesity is most common form of malnutrition affecting both develop and developing country. It has been associated with number of diseases including diabetes and hypertension. In the present study we tried to find out effect of obesity on pulmonary function. To record and compare pulmonary function parameters in obese and non obese individuals. Pulmonary function parameters were recorded in 50 non obese and 50 obese individuals using an RMS Helios 701 Spirometer. We found that all the pulmonary function parameters are less in obese subjects as compare to normal subjects except FEV1/FVC indicating restrictive type of ventilator changes in obese individuals. Obese individuals should be educated regarding hazardous effect of obesity on different body system. They should be motivated to lose weight and proper physiotherapy exercises should be taught to them to increase respiratory muscle strength.
**Key words:** Pulmonary function tests,obesity,restrictive diseases

## Introduction

Obesity may be defined as abnormal growth of adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyperplasic obesity) or a combination of both. Obesity is often expressed in terms of Body Mass index (BMI). Subjects having BMI more than 30 are considered as obese. Obesity is perhaps most common form of malnutrition. As a chronic disease it is prevalent in both developed and developing countries affecting child as well as adults. Overweight and obesity are fifth leading risk of global deaths. In 2008, more than 1.4 billion adults were obese and the incidence is increasing rapidly. Obesity is mainly attributed to decrease physical activity and faulty food habits[1]. Though the definite associations of obesity and diabtets, hypertension, gall bladder diseases and cancer have been well established there is lack of data regarding association of obesity and pulmonary function. So with the above concept the present study was undertaken to find out association between obesity and pulmonary function.

## Aims and objectives

To record pulmonary function parameters in non obese and obese individuals. To compare and analyze these parameters in non obese and obese individuals.

## Materials and methods

This study is a cross sectional study. A synopsis of the study protocol was submitted to the Institutional Ethics Committee and approval was obtained. The study was conducted in the Department of Physiology of the institute. The study was conducted from August 2008 to July 2010. All the subject who fulfilled the inclusion criteria then only he/she was included in the study. The study protocol was explained in detail to the selected subjects. All the subjects willing to participate in the study were asked to fill an informed consent form. Pulmonary function parameters were recorded by RMS Helios Spirometer.

**Inclusion criteria:**

Patients of

1) Age group: 30 – 60 years both males and females

**Exclusion criteria:**
Subjcets with
1) History of cardiac and respiratory diseases
2) History suggestive of diabetes mellitus or hypertension were excluded from the study.

**Recording of pulmonary function parameters:**
The pulmonary function parameters were measured in 50 non obese and 50 obese subjects using a computerized portable RMS Helios 702(Chandigarh) spirometer. This spirometer is automated and has a flow sensor which converts the airflow signals to digital signals. Values obtained were in litres and they were compared with the existing database for the normal healthy Indian population depending on age, sex, height and weight. The tests were conducted according to the American Thoracic Society/ European Respiratory Society (ATS/ERS) task force guidelines. [2,3] The pulmonary functions were recorded in the sitting position and before the subject had lunch. The subjects were instructed to wear loose clothes on the day of test. Name, age, sex, height and weight were entered in the spirometer. The procedures of all manoeuvres were demonstrated to the subject using mouthpiece. The parameters recorded are TV,ERV,IRV,IC,VC,MVV,FVC,FEV1,FEV1/FVC,PIFR and PEFR.

**Body Mass Index [1, 4]**
It is most widely used method to gauge obesity. It is also known as Quetelet index.

$$BMI = \text{Weight in Kg} / [(\text{Height in meters})^2]$$

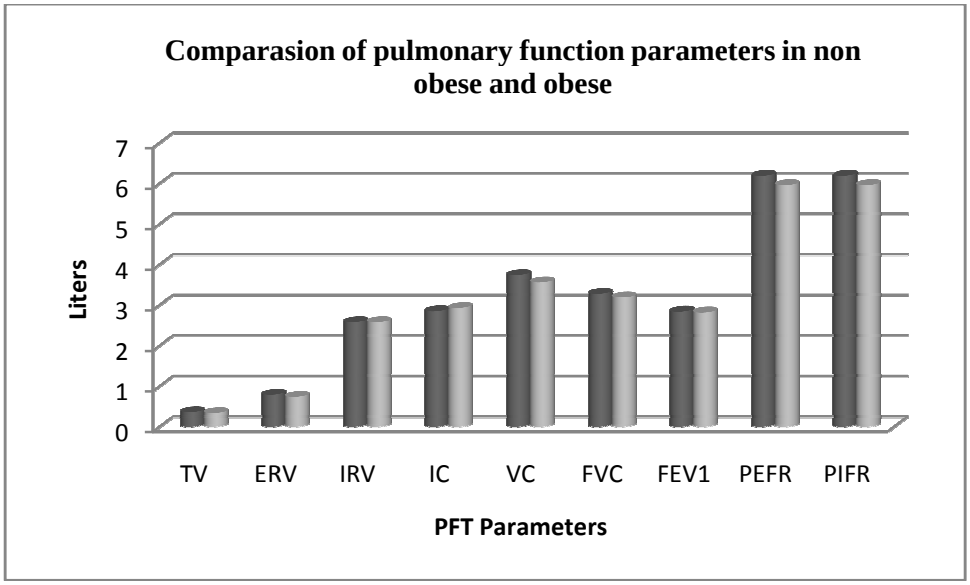
BMI of 30 is most commonly used as threshold for obesity both in male and female. BMI values are age independent and same for both sexes. Also, BMI does not distinguish between weight associated with muscle and weight associated with fat. Large scale epidemiologic studies suggest that morbidity due to metabolic diseases, cancers and CVS diseases begin to rise when BMI $\geq$ 25.

**Classification of adults according to BMI:**

| S. No | Classification | BMI |
|---|---|---|
| I | Underweight | < 18.5 |
| II | Normal range | 18.5 – 24.99 |
| III | Overweight | 25 – 29.9 |
| IV | Obese | >30 |

**Statistical analysis:**
The detailed data was entered into the Microsoft excel sheet and subsequently analyzed statistically by using SSPS 11.5 software. Values were reported as Mean ± S.D. Statistical analysis was carried out by t test.

**Results and Discussion**
We found all the pulmonary function parameters are reduced in obese individuals as compared to that of normal individuals except FEV1/FVC. (Table 1, graph 1).




**Graph.1**

**Table 1: Comparison of pulmonary function parameters in non obese and obese individuals**

| Pulmonary function parameters | Non obese Mean ± S.D. | Obese Mean ± S.D. |
|---|---|---|
| TV (in Lit.) | 0.36 ± 0.06 | 0.34 ± 0.05 |
| ERV (in Lit.) | 0.79 ± 0.19 | 0.74 ± 0.02 |
| IRV (in Lit.) | 2.58 ± 0.29 | 2.58 ± 0.24 |
| IC (in Lit.) | 2.95 ± 0.40 | 2.93 ± 0.28 |
| VC (in Lit.) | 3.74 ± 0.52 | 3.56 ± 0.52 |
| MVV (Lit/min.) | 93.63 ± 7.15 | 89.18 ± 8.11 |
| FVC (in Lit) | 3.28 ± 0.39 | 3.19 ± 0.45 |
| $FEV_1$ (in Lit.) | 2.84 ± 0.40 | 2.82 ± 0.44 |
| $FEV_1$/FVC (in %) | 85.17 ± 4.56 | 88.12 ± 4.79 |
| PEFR (Lit/sec.) | 6.19 ± 1.28 | 5.96 ± 1.35 |
| PIFR (Lit/sec.) | 6.19 ± 1.28 | 5.96 ± 1.35 |

**Discussions**

We found that all pulmonary function parameters are less in obese subjects as compared to normal subjects undergoing except FEV1/FEV. These indicate that in obese individuals there are restrictive types of ventilator changes.

Our results are similar to the results obtained by

1) Koenig, SM et al [5]
2) Costa D et al [6]

The decrease in pulmonary function parameters in obese subjects are because of following reasons:

1) The excess body fat in obese patients affects chest wall mechanics. This decreases the compliance of the respiratory system due to mass loading reducing PFT values.[7,8]
2) In obese patients fat laden respiratory muscles have poor tone which causes early respiratory insufficiency.

All these changes cause restriction in physical activity in obese individuals.

## Conclusion

Prevention of obesity should begin in early childhood. Obesity is harder to treat in adult than in children. The control of obesity can be achieved by dietary changes, increased physical activity and a combination of both. In addition to this obese person should be educated regarding health hazards associated with obesity. They should be taught proper physiotherapy exercises to increase respiratory muscle strength. They should be encouraged to do regular heath check up including blood sugar, blood pressure and pulmonary function tests. So that any complication will be identified at an earlier stage.

## Referances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