ORIGINAL RESEARCH

Comparison of FVC and FEV in obese males and non-obese males

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ABSTRACT
Obesity may develop at any age in either sex and in as increasing health problem. Obesity develops over time and, once it develops, is difficult to treat. The excess of fat in men tends to accumulate in the upper abdomen. In women, the favoured sites for the accumulation of fat are the buttocks, hips and thighs. The site of fat accumulation is considered a predominant factor for metabolic disorders of obesity. However, the overall incidence of obesity was found to be higher among women than men. All subjects were explained about the procedures to be undertaken and written informed consent was obtained from them. A brief history, general physical examination and clinical examination of all the systems were done to exclude medical problems and to prevent confounding of results. The mean FVC (L) in non-obese male controls was 3.32 ± 0.33. The mean FVC (L) in obese male subjects was 1.82±0.51.There was statistically significant decrease in the value of FVC in obese male subjects compared to non-obese controls ($p< 0.001$).

Keywords:FVC, FEV, obese males

INTRODUCTION

Sound health and physical fitness are positively associated with good mental health and wellbeing. People who take regular physical exercise report less anxiety and depression and lower level of stress than do sedentary people.

Obesity is a chronic condition characterized by an excessive accumulation of fat on human body, which causes a generalized increase in body mass. Overweight refers to increased body weight in relation to weight, when compared to the same standard of acceptable or desirable weight.[1]

Kopelman defines the term obesity as “excess fatness” or fatness leading to pathology. The amount of excess fat, its distribution within the body, and the associated health consequences vary considerably between obese individuals.

Various explanations for these increases have been put forward, such as sedentary lifestyles and higher levels of fat intake.The risk of obesity may vary between different ethnic groups. Asians are at greater risk of developing obesity when compared to Afro-Caribbean and Caucasian people. South Asians are particularly at risk of developing abdominal obesity and there is also an increased prevalence of insulin resistance in this group Peoples' risk of obesity varies over the life cycle.[2]

One such review on this subject was done in 1957 by Kaplan and Kapian. They concluded that "the ultimate cause of the great majority of cases of obesity is psychologically determined hyperphagia".Their anxiety-reduction model proposed that overeating by obese individuals reduces anxiety and that this is responsible for the development and maintenance of the hyperphagia believed to cause obesity. The concept that emotion strongly influences eating, hereafter referred to as "emotional eating," has generated considerable interest in clinical and experimental studies.[3]

One such review demonstrates that psychosocial risk factors during childhood may be associated with attained high BMI in adolescence and adulthood. In particular, there was some evidence of an association between childhood depression, abuse and lack of parental support and difficulties in school and development of adult obesity.[4]

Obesity may develop at any age in either sex and in as increasing health problem. Obesity develops over time and, once it develops, is difficult to treat. The excess of fat in men tends to accumulate in the upper abdomen. In women the favored sites for the

accumulation of fat are the buttocks, hips and thighs. The site of fat accumulation is considered a predominant factor for metabolic disorders of obesity. However, the overall incidence of obesity was found to be higher among women than men.[5]

The risk of obesity for men increases during the late thirties. However, women may face an increased risk at several stages in their lives, for example when entering marriage, during pregnancy, during menopause and at retirement. Smoking cessation is also an important risk factor for weight gain, for either sex. It is widely believed that avoiding overweight and obesity, and achieving weight loss in obese or overweight persons, is beneficial to health.[6]

METHODOLOGY

60 obese and 60 non-obese males in the age group of 25-40 years were selected randomly from the general population for Spirometric evaluation after obtaining informed consent.

INCLUSION CRITERIA

- Obese males aged 25-40 years.
- Non-obese males aged 25-40 years.

EXCLUSION CRITERIA

- Age below 25 years and above 40 years
- Subjects with a history of Asthma, Diabetes mellitus, hypertension, other cardiovascular diseases, chest disease or deformity, endocrine diseases or surgery.
- Subjects on chronic medication.
- Smokers
- Alcoholics
- Subjects with noticeable weight gain or weight loss over the preceding 3 months.

Based on this information by using tables of sample size, the sample size was found to be 60 subjects in each study and control group.

The criteria for obesity were taken on the basis of body mass index as per the standard protocol.

Height (m) and weight (kg) of the subjects will be recorded and BMI calculated as

$$\text{Body mass index} = \frac{\text{Weight (Kilogram)}}{\text{Height}^2 \text{ (meter)}} \quad \text{[Quetelet's index]}$$

Subjects will be classified into 2 groups based on BMI as follows:

Normal- BMI 18.5-25 kg / m2

Obese-BMI >30 kg / m2.

A structured Performa was used to collect the relevant information.

All subjects were explained about the procedures to be undertaken and written informed consent was obtained from them.

A brief history, general physical examination and clinical examination of all the systems were done to exclude medical problems and to prevent confounding of results.

The following tests will be performed in a sitting position 2-3 hours after light breakfast in sequence after familiarizing the subjects with the testing procedures.

LUNG FUNCTION TESTS

The following lung parameters will be measured:

- Forced vital capacity (FVC) in litres.
- Forced expiratory volume in the first second. (FEV_1) in litres

The results for each parameter were compared between the obese and non-obese men and statistically analyzed.

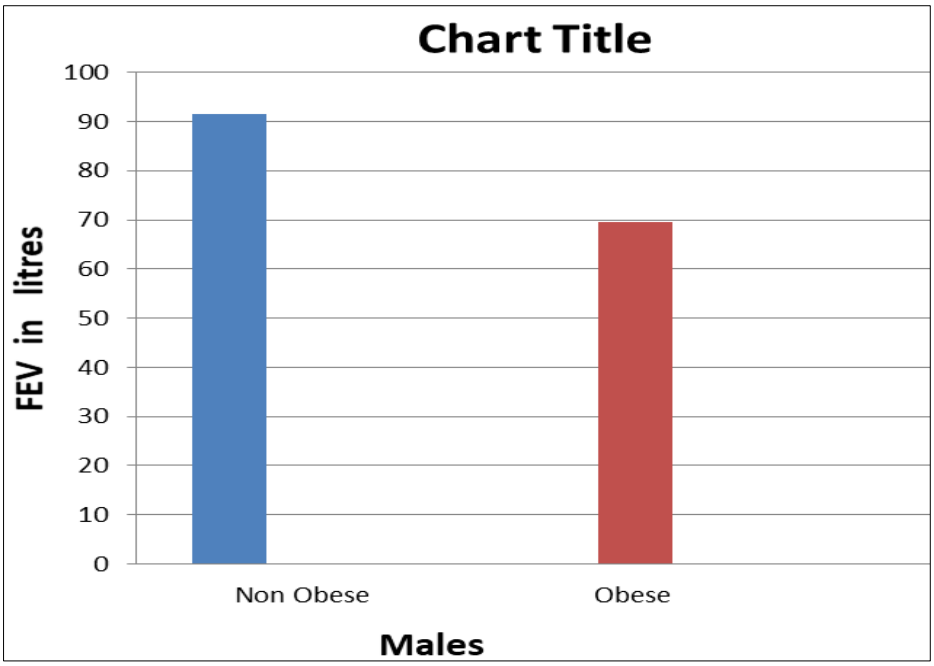
STATISTICAL ANALYSIS: Correlation between BMI and all other parameters will be assessed by calculating Pearson's correlation co-efficient. The data will be compared using the student's Un-paired t test at 95% confidence level.

RESULTS

Table 1: Comparison of FVC between Non Obese and Obese Males

Groups	n	Actual value(L)		% Predicted	
		Range	Mean ±SD	Range	Mean ±SD
Non -Obese	60	2.56-4.11	3.32±0.33	68-106	91.58±7.16
Obese	60	1.22-3.67	1.82±0.51	49-113	69.61±14.18
Mean Difference		1.49		21.97	
Significance	t-value	18.97		10.71	
	p-value	0.000		0.000	

The mean FVC (L) in non-obese male controls was 3.32±0.33. The mean FVC (L) in obese male subjects was 1.82±0.51.There was statistically significant decrease in the value of FVC in obese male subjects compared to non-obese controls ($p < 0.001$).



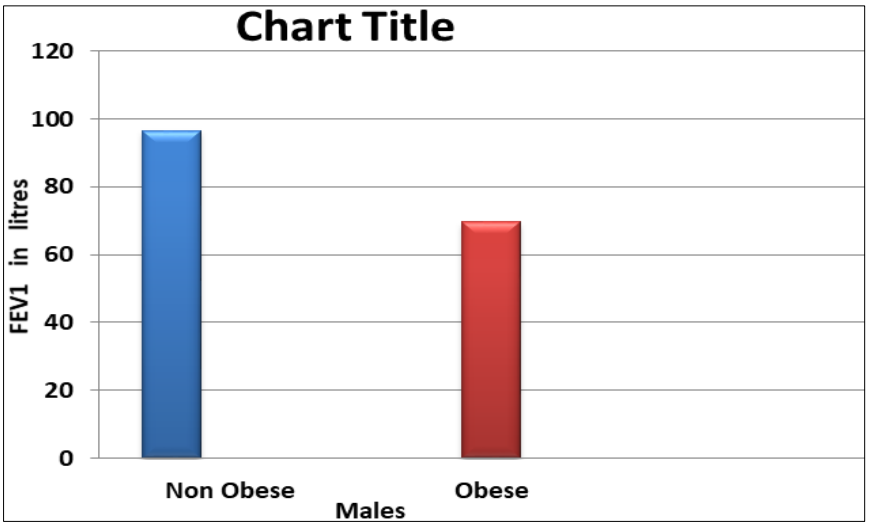
Graph 1: FVC IN Obese subjects and Non obese controls

Table 2: Comparison of FEV1 between Non Obese and Obese Males

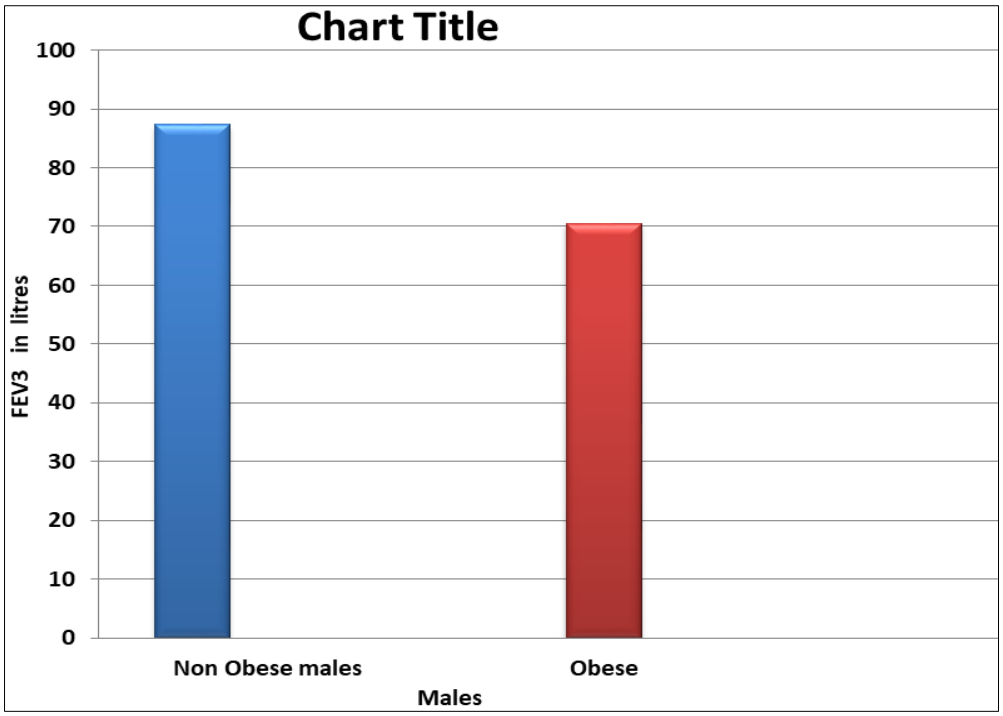
Groups	n	Actual value(L)		% Predicted	
		Range	Mean ±SD	Range	Mean ±SD
Non -Obese	60	2.46 - 3.72	3.01± 0.34	74-115	96.65±8.28
Obese	60	1.10 - 3.42	1.51±0.35	56-108	69.57 ± 8.84
Mean Difference		1.50		27.08	
Significance	t-value	23.78		17.31	
	p-value	0.000		0.000	

Table 3: Comparison of FEV3 between Non Obese and Obese Males

Groups	n	Actual value(L)		% Predicted	
		Range	Mean ±SD	Range	Mean ±SD
Non -Obese	60	1.89-3.82	3.01±0.43	67-107	87.35±10.14
Obese	60	1.18-3.92	1.81±0.55	52-115	70.57±10.89
Mean Difference		1.12		16.78	
Significance	t-value	13.37		8.74	
	p-value	0.000		0.000	



Graph 2: Fev1 in obese subjects and non obese controls



Graph 3: fev3 in obese subjects and non obese controls

FEV1 (L)

The mean FEV1 in non obese male controls was 3.01± 0.34 (96.65±8.28 of percentage predicted). The mean FEV1 (L) in obese male subjects was 1.51±0.35 (69.57 ± 8.84 of percentage predicted). There was statistically significant decrease in the value of FEV1 in obese male subjects compared to non-obese male controls ($p< 0.001$).

FEV3 (L)

The mean FEV3 in non-obese male controls was 3.01± 0.43 (87.35±10.14% of the percentage predicted). The mean FEV3 in obese male subjects was 1.81 ±0.55 (70.57±10.89% of percentage predicted). There was statistically significant decrease in the value of FEV3 in obese male subjects compared to non-obese male controls.

DISCUSSION

Spirometric variables, such as forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC), tend to decrease with increasing BMI. The expiratory flow at 50% of the reduced vital capacity is low compared with the predicted value, based on the predicted vital capacity. Significant differences in expiratory flow at 25% of the reduced vital capacity persisted after normalization, suggesting the possibility of peripheral airway obstruction in obese men. Respiratory resistance is increased in the obese, indicating that airway caliber is reduced throughout the tidal breathing cycle. A reduction in the FEV1/FVC ratio indicates airway narrowing, the severity of which is indicated by the absolute value of FEV1. Because no obstructive impairment was detected in any of the obese, results are indicative of airflow limitation without significant obstruction.[7]

Studies of diet-induced obesity in rats have reported changes in lipid deposition in the lungs, which may affect surfactant function [8]. There is some evidence that peripheral airway obstruction may be increased in the obese, since the frequency dependence of resistance increases with increasing obesity.

Obese individuals have an increased demand for ventilation and breathing work load, respiratory muscle inefficiency, decreased functional reserve capacity and expiratory reserve volume, and closure of peripheral lung units. These often result in a ventilation-perfusion (V/Q) mismatch, especially in the supine position.[9]

In an upright nonobese individual, the distribution of regional ventilation is greatest in the lower, dependent lung zones and decreases toward the upper zones. In obese individuals, this distribution may be reversed. The limitations in chest wall and diaphragm movements alter the configuration of the lungs and enhance basal air trapping at low lung volumes. Mild hypoxemia and increased alveolar-arterial oxygen difference are frequently reported, even in eucapnic obese individuals and have been associated with abdominal obesity in the morbidly obese.Obesity is a classical cause of alveolar hypoventilation.[10]

Obesity also influences upper airway reflexes, lung mechanics and may affect the central control of breathing. Obesity has a clear potential to have a direct effect on respiratory well-being, since it increases oxygen consumption and carbon dioxide production, while at the same time it stiffens the respiratory system and increases the mechanical work needed for breathing.

CONCLUSION

- There was statistically significant decrease in the value of FVC in obese male subjects compared to non-obese controls
- There was statistically significant decrease in the value of FEV1 in obese male subjects compared to non-obese male controls
- The mean FEV3 in obese male subjects was 1.81±0.55 (70.57±10.89% of percentage predicted). There was statistically significant decrease in the value of FEV3 in obese male subjects compared to non-obese male controls

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