Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2017; 5(10C):3984-3987 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI:10.36347/sjams.2017.v05i10.036

Obesity and Pulmonary Functions among Indian Men: A Comparative Study

Dr. Shinde Ravindra Janardan[1], Dr. Anarse Krushna Gyandeo[2], Parjane Nilesh Raosaheb[3], Dr. Pandve Harshal Tukaram[4],

[1]Assistant Professor, Dept. of Pulmonary Medicine, Dr. Vasantrao Pawar Medical College, Hospital & Research Centre Nashik, Maharashtra, India

[2]Professor & Head, Dept. of Pulmonary Medicine, Padmashree Dr. Vikhe Patil Medical College, Viladghat, Ahmednagar, Maharashtra, India

[3]Senior Resident, Dept. of Pulmonary Medicine, Padmashree Dr. Vikhe Patil Medical College, Viladghat, Ahmednagar, Maharashtra, India

[4]Associate Professor, Dept. of Community Medicine, Smt. Kashibai Navale Medical College, Narhe, Pune, Maharashtra, India

Original Research Article

***Corresponding author**
Dr. Anarse Krushna Gyandeo

Article History
Received: 05.10.2017
Accepted: 12.10.2017
Published: 30.10.2017

Abstract: Obesity is known to have significant effects on respiratory function and obese patients commonly report respiratory complaints requiring pulmonary function tests (PFTs). To determine the effect of obesity on PFTs in Indian men who did not have evidence of underlying diseases of the respiratory system. A cross sectional hospital based study was conducted among apparently healthy men who did not have evidence of underlying diseases of the respiratory system. The study subjects were categorized as per Body Mass Index (BMI). The study subjects who had BMI of 18-24.9 kg/m ^{2} were categorized as non-obese and who had BMI above 30 were categorized as obese. Spirometry test was performed on both obese and non-obese study subjects and various values of the same were compared for any differences. Mean, standard deviation was used for descriptive analysis and unpaired t test was used as test of significance. Total 200 randomly selected men who did not have evidence of underlying diseases of the respiratory system were included in the study. 100 men were non-obese and 100 men were obese as per the BMI. There was statistically significant difference in FVC and FEV1 in non-obese and obese study subjects ($p<0.05$). FVC and FEV1 were significantly lower in the obese men. However no statistically significant difference was found in FEV1 / FVC ratio, PEF, MEF ($p>0.05$). Obesity has significant effects on lung function of Indian men and the greatest effects were on FVC and FEV1. These physiological effects of weight gain should be considered when interpreting PFTs and their effects on respiratory symptoms even in the absence of disease and may also exaggerate existing lung diseases.

Keywords: Obesity, BMI, Pulmonary Function Test, Men, India

INTRODUCTION

According to the World Health Organization (WHO), obesity is one of the most common, yet among the most neglected, public health problems in both developed and developing countries[1]. Obesity is associated with increased morbidity, and mortality. Range of health serious issues such as diabetes, hypertension, dyslipidemia, ischemic heart diseases, obstructive sleep apnea, stroke are correlated with obesity.

India, with 1.25 billion people is the second most populous country in the world and is currently experiencing rapid epidemiological transition. Undernutrition due to poverty which dominated in the past, is being rapidly replaced by obesity associated with affluence. Industrialization and urbanization also contribute to increased prevalence of obesity. Studies from different parts of India have provided evidence of the rising prevalence of obesity [2]. According to the NFHS-3 data, Maharashtra state which is one of the most industrialized and urbanized state in India has 15.9% obese men [3].

Obesity can cause various deleterious effects to respiratory functions, such as alterations in the respiratory mechanics, decrease in respiratory muscle strength and endurance, decrease in pulmonary gas

exchange, lower control of breathing, and limitations in pulmonary function tests. The mass loading effect of adiposity on the thoracic cage and abdomen can have an effect on respiratory mechanics leading to decreased chest wall and lung compliance, decreased pulmonary gas exchange, limitations in exercise capacity and altered pulmonary physiology [4].

Although the impact of obesity on PFTs has been addressed in previous studies [4], the results have been inconsistent among the population and there are very few studies among Indian population. Therefore this study was carried out with objective to determine the effects of obesity on PFTs among healthy men by spirometry, because it is considered to be the initial screening tool for pulmonary diseases, most widely used, economic, and easy to conduct using equipment that is available in all pulmonology laboratories.

MATERIALS AND METHOD

This study was carried out in the teaching tertiary care institute located in the Central Maharashtra, India which is catering its services to urban, semi urban as well as rural population in the central Maharashtra.

Randomly selected apparently healthy men who did not have evidence of underlying diseases of the respiratory system were included in the study. These randomly selected study subjects were further divided in to two groups as obese and non-obese based on the Body Mass Index. BMI of 18-24.5 kg/m^2 was taken as normal and BMI above 30 kg/m^2 was taken as obese. Clinical details and baseline parameters were recorded on a well-designed proforma.

Estimation of BMI

The weight was measured with the subject wearing light clothing and barefoot on a TANITA Weighing scale. The standing height was measured without shoes with the subjects back to a vertical board. BMI was measured by calculating the weight in kilograms divided by the square of the height in meters.

Spirometry Test intervention details

The spirometry tests were conducted using an electronic easy one spirometer (NDD Medical Systems Pvt. Ltd.) in the well ventilated Out Patient Department. The tests were performed by trained technician. Tests were done in sitting position, using techniques recommended by American Thoracic society (ATS).The subjects were asked to take maximum inspiration and then exhale forcefully in the mouthpiece and continue it for 6 seconds, after that take maximum inspiration. The validity of the tests verified using ATS recommendations.

STATISTICAL ANALYSIS

The analysis of data involved descriptive statistics such as mean, standard deviation and unpaired t test was used as test of significance.

Ethical considerations

The study was conducted according to the Declaration of Helsinki, the protocol was reviewed and approved by the independent ethics committee. Written informed consent was obtained.

RESULTS

Total 200 apparently healthy men without any history of underlying respiratory disease were participated in the study. Based on BMI values they were equally divided in to two groups. 100 study subjects were obese and 100 study subjects were non-obese.

The mean age of obese group was 50.33 years (SD=7.74 years) while mean age of non-obese group was 48.08 years (SD= 9.92). There was no statistically significant difference between the ages of the two groups. Mean height of obese group was 165.97 cm (SD=5.76 cm) while mean height of the non-obese group was 166.70 cm (SD=5.42 cm). No statistically significant difference was observed. Mean weight of the obese group was 81.07 kg (SD= 10.80 kg) and mean weight of the non-obese group was 63.27 kg (SD=6.01 kg) which has shown statistically significant difference between the two groups. Mean BMI of the obese group was 31.32 kg/m^2 (SD=1.37 kg/m^2) and mean BMI of the non-obese group was 22.43 kg/m^2 (SD=1.42 kg/m^2) which has shown that there was statistically significant difference between the BMI of the two groups.

Table-1: Important Parameters of the study subjects

Parameter	**Non-obese group (N=100)** Mean (SD)	**Obese group (N=100)** Mean (SD)	**p- value**
Age (years)	48.08 (9.92)	50.33 (7.74)	0.171 (NS)
Height (cms)	166.70 (5.42)	165.97 (5.76)	0.468 (NS)
Weight (kg)	63.27 (6.01)	81.07 (10.80)	0.034 (S)
BMI (kg/ m^2)	22.43 (1.42)	31.32 (1.37)	0.047 (S)

*p<0.05 Significant (S); p>0.05 Not significant (NS)

Spirometry values of the two groups were also determined and compared. There was significant difference in FEV1& FCV between two groups. The obese subjects exhibited significantly lower FVC and FEV1 values than non-obese subjects. However we did not observe any significant difference in FEV1/FVC, PEF, MEF25-50 values in both groups.

Table-2: Comparison of Spirometry variables of the non-obese and obese group

Spirometry Values	**Non-obese group (N=100)** Mean (SD)	**Obese group (N=100)** Mean (SD)	**p- value**
FVC (l)	3.06 (0.65)	2.72 (0.43)	0.027 (S)
FEV1 (l)	2.45 (0.54)	2.22 (0.47)	0.049 (S)
FEV1/FVC	80.41 (6.30)	81.00 (5.22)	0.682 (NS)
PEF	7.11 (1.80)	7.08 (1.71)	0.945 (NS)
MEF 25-50	2.61 (1.01)	2.43 (0.81)	0.362 (NS)

*p<0.05 Significant (S); p>0.05 Not significant (NS)

DISCUSSION

The pulmonary function tests (PFTs) are the battery of simple tests that are used to assess the physiological respiratory efficiency of an individual. The factors that usually affect the values of pulmonary function tests are age, gender, height, race or ethnicity, and possibly obesity. Weight may have effects on pulmonary function tests by causing small airway dysfunction and expiratory flow limitation and limitations in exercise capacity. It is a simple procedure for the assessment and monitoring of respiratory diseases. BMI is considered as the gold standard for measuring of accumulation of adipose tissue, because it is calculated using the height and weight of an individual. Previous studies have revealed that pulmonary function is influenced by BMI in men.

In the present study effect of BMI on lung functions were determined. We observed that obese subjects exhibited significantly lower FVC and FEV1 values than non-obese subjects. This difference was statistically significant while we did not observe any significant difference in FEV1/FVC, PEF, MEF25-50 values in both groups.

As per study conducted by Ajith Pakkala and Arit Pakalla in south Indian population found that FEV1 , FVC, and FEV_1 /FVC ratio measured in obese patients were significantly reduced compared with normal BMI individuals[5]. while Attaur-Rasool *et al.* found that Obese subjects had significantly lower FVC percentages as well as significantly lower FEV1 percentages as compared to normal subjects[6]. According to Carey *et al.* commented that a 10 kg weight gain induced a drop in FEV_1 by 96mL in men [7]. Thyagarajan *et al*. observed that individuals with a BMI $\geq$26.4kg/m^2 had a reduction of 64mL in FEV_1 in 10 years. During the same period, individuals with a BMI <21.3kg/m^2 showed an increase of 60mL in the FEV_1, with no reduction up to 38 years of age[8]. Steele *et al*. found that the central fat deposit seemed to be more strongly related to the lung function in men than in women [9]. As per Mehari *et al.* study functional residual capacity and expiratory reserve volume decreased exponentially with increasing BMI, such that morbid obesity resulted in patients breathing near their residual volume. However, the effects on the extremes of lung volumes, at total lung capacity and residual volume were modest. There was a significant linear inverse relationship between BMI and DLCO, but the group means values remained within the normal ranges even for morbidly obese patients [4].

CONCLUSION AND RECOMMENDATION

In the present study we found that obesity had certain detrimental effects on the lung functions as per spiromentry values. Men who were obese exhibited mechanical modifications of spirometry. We conclude that physiological effects of obesity should be considered when interpreting PFTs and their effects on respiratory symptoms even in the absence of disease. We further recommend that larger and multicentre studies should be carried out to determine effects of obesity among different group individuals based on demographic variables.

REFERENCES

1. World Health Organization. Obesity: preventing and managing the global epidemic. World Health Organization; 2000.
2. Pradeepa R, Anjana RM, Joshi SR, Bhansali A, Deepa M, Joshi PP, Dhandania VK, Madhu SV, Rao PV, Geetha L, Subashini R. Prevalence of generalized & abdominal obesity in urban & rural India-the ICMR-INDIAB Study (Phase-I)[ICMR-INDIAB-3]. The Indian journal of medical research. 2015 Aug;142(2):139.
3. Parish WL, Laumann EO, Mojola SA. Sexual behavior in China: Trends and comparisons. Population and Development Review. 2007 Dec 1;33(4):729-56.
4. Mehari A, Afreen S, Ngwa J, Setse R, Thomas AN, Poddar V, Davis W, Polk OD, Hassan S, Thomas AV. Obesity and pulmonary function in African

Americans. PloS one. 2015 Oct 21;10(10):e0140610.
5. Pakkala A, Pakkala A. Effect of obesity on lung function tests in South Indian population. Kasr Al Ainy Medical Journal. 2015 Sep 1;21(3):76.
6. Attaur-Rasool S, Shirwany TA. Body mass index and dynamic lung volumes in office workers. J Coll Physicians Surg Pak. 2012 Mar;22(3):163-7
7. Carey IM, Cook DG, Strachan DP. The effects of adiposity and weight change on forced expiratory volume decline in a longitudinal study of adults. International Journal of Obesity & Related Metabolic Disorders. 1999 Sep 1;23(9).
8. Thyagarajan B, Jacobs DR, Apostol GG, Smith LJ, Jensen RL, Crapo RO, Barr RG, Lewis CE, Williams OD. Longitudinal association of body mass index with lung function: the CARDIA study. Respiratory research. 2008 Apr 4;9(1):31.
9. Steele, RM, Finucane FM, Griffin SJ, Wareham NJ, Ekelundm U. Obesity is associated with altered lung function independently of physical activity and fitness. Obesity 2009;17: 578–584.