

## Forced expiratory flow during 25%-75% of expiration in middle aged obese and non-obese females – A comparative study

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### Abstract

**Introduction:** Obesity can cause various health hazards in women in many ways. Overweight or being obese is associated with various risk factors like diabetes and coronary artery disease in women. The incidence of obesity is increasing worldwide. Obesity can cause alteration in pulmonary function which may lead to early morbidity and mortality. FEF<sub>25%-75%</sub> is one of the most effort independent portion of the curve, more sensitive parameter to airflow in peripheral airways, where disease of chronic airflow obstruction can begin. Reduced Expiratory Flow rate value in obese individuals may be probably due to increase in the total peripheral resistance and airway resistance with obesity. Hence the present study was undertaken to know the impact of obesity on Forced Expiratory Flow rate<sub>25%-75%</sub> in middle aged obese females.

**Aims and Objectives:** The present study was conducted to compare Pulmonary function test parameter FEF<sub>25%-75%</sub> in middle aged obese and non-obese females, to determine the impact of obesity on FEF<sub>25%-75%</sub>.

**Materials and Methods:** Dynamic Pulmonary Function tests (PFTs) of 50 normal, healthy, non-obese middle aged females and 50 healthy but obese middle aged females, age group 30-45 years of Hubli city were determined and were compared with its normal counterparts. Study subjects were classified into obese and non-obese based on WHO classification of BMI. To obtain the dynamic pulmonary function test computerized Spirometer Eazy on-PC model were used. Dynamic PFT parameter FEF<sub>25%-75%</sub> was used as measure of lung function.

**Results:** In our Study conducted, middle aged obese females had FEF<sub>25%-75%</sub> (litre) of 2.53± 0.85 compared to corresponding values in controls were 2.77±1.06. Our study showed statistically significant differences between two groups.

**Conclusion:** In our study Dynamic pulmonary function test parameter FEF<sub>25%-75%</sub> showed statistically significant reduction in obese compared to non-obese middle aged females.

**Keywords:** Obesity, Middle aged obese, Pulmonary function test (PFT), FEF<sub>25%-75%</sub>.

### Introduction

Obesity is a chronic disease associated with excessive body fat which can cause damage to the health of an individual and is associated with various co-morbidities such as diabetes and hypertension and vascular dysfunction. Obesity can cause enormous hazardous effect on respiratory system, like changes in respiratory mechanics, respiratory muscle strength and endurance, reduction in pulmonary gas exchange, reduced control of breathing, limitations in pulmonary function tests and can cause impairment of an individual health and can change quality of life of an individual.<sup>3</sup> Obesity can also affect various body systems which may lead to higher rate of morbidity and mortality in the population. Of the various system affected by the obesity the respiratory system carries important attention because obesity can bring about major changes in respiratory mechanics, gas exchange mechanism, respiration control pattern and also changes in strength and endurance of respiratory muscle.<sup>4</sup> Most important respiratory complications of obesity are enhanced demand for ventilation, increase in work of breathing, respiratory muscle insufficiency and reduced

respiratory compliance. Respiratory function can also be obtained by interaction of lungs, Chest wall and muscles. Obesity brings about reduction in chest wall compliance, respiratory muscle function as well as peripheral airway size.<sup>5</sup> Obesity is one of the most important cause of reduced pulmonary function.<sup>6</sup>

### Materials and Methods

The present study was conducted in the Physiology department, KIMS, Hubli. Data were obtained from 50 middle aged non-obese females of 30-45 years of BMI < 30 kg/m<sup>2</sup> and 50 middle aged obese females of 30-45 years of BMI 30 kg/m<sup>2</sup> and above. The study subjects were selected in and around Hubli city based on our inclusion and exclusion. The determination of Dynamic pulmonary function was performed by Spirometry using an Eazy on-PC model, computerized Spirometer (nddmedizintechnik AG), Zurich. The study and the control group were selected based on inclusion and exclusion criteria.

#### Inclusion Criteria:

1. Age 30-45 years

2. Middle age females falling in range of normal and obese Body mass Index
3. Apparently Healthy Individuals
4. Sedentary
5. Non-Smokers

**Exclusion Criteria:**

1. History of smoking
2. Subjects with chest wall deformities
3. Subjects having obstructive or restrictive type of airway diseases
4. History of Diabetes, Hypertension, cardiovascular diseases were excluded from the study.

The protocol for our study was obtained and was approved by the institutional ethical committee .The procedure to perform the dynamic Pulmonary Function was instructed to the. These subject group were categorized into non-obese and obese based on the chart provided by WHO for body mass index BMI (kg/m<sup>2</sup>).

<18.5	Underweight
18.5-24.99	Normal Weight
25- 29.99	Overweight
30 and above	Obese

BMI: was calculated based on the Quetelets index,  
 BMI = Weight (in kgs)/Height <sup>2</sup>(in meters)

The subject who had BMI < 30 kg/m<sup>2</sup> were considered as non- obese. The subjects with a BMI 30 kg/m<sup>2</sup> and above were considered as obese:

**Spirolyser:** The determination of Dynamic pulmonary function was determined by Spirometry using an Easy on- PC model, Computerized spirometer (niddmedzintechnik AG CH- 8005) Zurich, Switzerland. It plugs directly into the USB port of a PC. It works on ultrasonic Doppler principle. The directly evaluated parameters were lung volumes, capacities, and Flow through the procedures of Forced Vital Capacity (FVC), were performed at least three times each, according to the standards of American Thoracic Society (ATS) with the subjects in sitting position. The FVC procedure done were allowed for the determination of Expiratory Flow<sub>25%-75%</sub>(FEF<sub>25%-75%</sub>).

**Results**

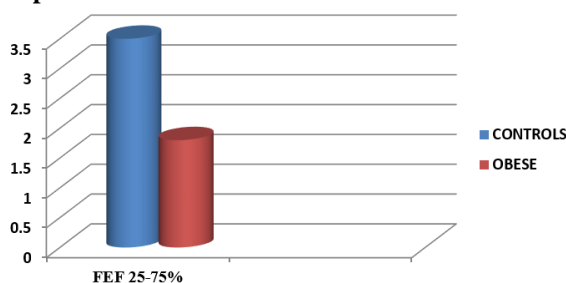
The data obtained were tabulated, analysed and expressed as Mean ± Standard Deviation (Mean ± SD) for the assessment of anthropometric and Expiratory Flow<sub>25%-75%</sub>(FEF<sub>25%-75%</sub>). in both the groups. For comparison of parameter Expiratory Flow<sub>25%-75%</sub>(FEF<sub>25%-75%</sub>) parameter between the two groups, the unpaired student’s ‘t’ test was applied and statistical significance was indicated by ‘P’ value less than 0.05(p<0.05). In the present study obese middle aged females had FEF<sub>25%-75%</sub>of 2.53±0.85 whereas correspondent values in non-obese middle aged females was FEF<sub>25%-75%</sub>of 2.77±1.06. Middle aged Obese females had lesser FEF

<sub>25%-75%</sub>compared to non-obese middle aged counterparts which was statistically significant (p<0.05).

**Table 1: Flow rates of obese females and controls**

	No of subjects	FEF <sub>25%-75%</sub>
Obese	50	2.53±0.85
Controls	50	2.77±1.06
P value		<0.05(S)

**Graph 1: Flow rates of obese females and controls**



**Discussion**

Maximum Expiratory flow rate is the peak flow rate obtained between the initial 200ml and 1200 ml of FVC. FEF<sub>25%-75%</sub> is used these now a days as it is the most effort independent portion of the curve also most sensitive to airflow in peripheral airways, where disease of chronic airflow obstruction are thought to begin. Reduced Expiratory Flow rate value in obese individuals compared to non- obese individuals may be most likely due to increase in the total peripheral resistance and airway resistance which is associate with obesity.

Present study is concordance with the study done by Paralikar SJ et al. In their study have found out that obese had lower values and FEF<sub>25%-75%</sub> were strongly negatively correlated with body weight, BMI, waist circumference, hip circumference, and waist-to-hip ratio.<sup>1</sup>

Similar negative correlation between BMI and pulmonary function was observed by Sri Nageswari et al. In their study conducted among group of obese children of mixed socioeconomic status from Punjab, India. They have found with increasing waist circumference and hip circumference, pulmonary function were decreased. Waist-to-hip ratio was negatively correlated FEF<sub>25%-75%</sub>. They have stated that obesity is characterized by decrease in chest wall compliance due to increased amount of adipose tissue around the chest and abdomen, which can decreases pulmonary functions in these children.<sup>2</sup> In our Study conducted, middle aged obese females had lower FEF<sub>25%-</sub>compared to corresponding values in controls. Our study showed statistically significant difference in obese middle aged females compared to non-obese middle aged females.

## Conclusion

A comparative study of Dynamic lung Pulmonary function test were carried in the Physiology department KIMS Hubli in obese & non- obese middle aged Females.

The present study showed FEF<sub>25%-75%</sub>, values were significantly reduced in middle aged obese females compared to middle aged non-obese females.

This indicates that obesity can alter the Dynamic pulmonary functions which may give rise to long term complications in later life and may lead to early mortality and morbidity in the general population. Hence from the present study we conclude that Dynamic pulmonary function test parameter FEF<sub>25%-75%</sub>, were significantly reduced in middle aged obese females when compared to the normal weight counterparts. Obesity had significant impact on pulmonary function tests in middle aged obese females of Hubli city.

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