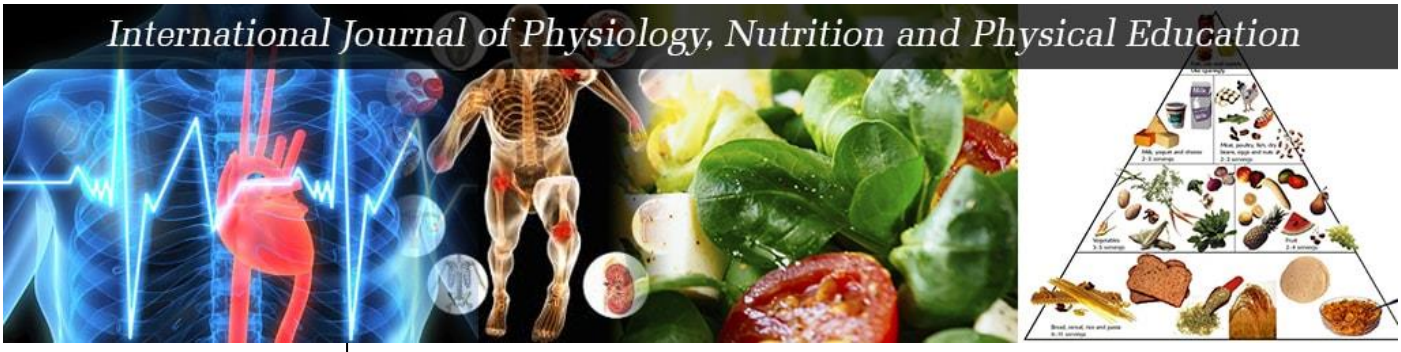

ISSN: 2456-0057
IJPNPE 2018; 3(1): 2087-2089

www.journalofsports.com
Received: 15-11-2017
Accepted: 16-12-2017

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A correlative study of the different grades of body mass index with PEFR in young adults

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Abstract
Obese people are at increased risk of respiratory symptoms, such as breathlessness, particularly during exercise, even if they have no obvious respiratory illness [2]. Obesity causes increased resistance to the passage of air throughout breathing due to narrowing of the airways [5, 6]. Asian Indians have higher percentage body fat, abdominal adiposity at lower or similar BMI levels as compared to white Caucasian. It has been recommended that different BMI cutoff points be used to determine overweight and obesity in certain racial groups. The current Consensus Statement for Revised BMI Cut-offs for Asian Indians: Normal BMI: 18.0-22.9 kg/m^2; Overweight: 23.0-24.9 kg/m^2; Obesity: >25 kg/m^2 [4]. All the participants were divide into three group of 30 each- normal weight, overweight and obese according to BMI Cut-offs for Asian Indians. Peak Expiratory Flow rate (PEFR) is recorded by computerized spirometer. Result show there is increase in PEFR in overweight as compared to normal which means increased in BMI causes increase in muscle strength. In obese group PEFR is less as compared to normal group. Proper and timely advice on weight reduction will also help in prevent respiratory complications.

Keywords: Obese, overweight, PEFR, BMI

Introduction
Obesity has been the prime pandemic problem predisposing to multiple metabolic, mechanical and moleculer derangement leading to diversity of diseases.
Overweight / Obesity, is defined as abnormal or excessive fat accumulation that presents a risk to health. Obesity has reached epidemic proportions globally; once associated with affluent developed countries, it now has also become prevalent in developing countries [1].
Obese people are at increased risk of respiratory symptoms, such as breathlessness, particularly during exercise, even if they have no obvious respiratory illness [2]. 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. The reduced immune mechanisms also acts as contributory factor.
The World Health Organization adopted weight classification developed by the National Institutes of Health's "Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults" – The evidence report [3], published in 1998, operationally defined 'overweight' as a BMI of 25 kg/m^2 to 29.9 kg/m^2 and 'obesity' as a BMI of at least 30 kg/m^2.It has been recommended that different BMI cut off points be used to determine overweight and obesity in certain racial groups. The Consensus Statement for Revised BMI Cut-offs for Asian Indians: Normal BMI: 18.0-22.9 kg/m^2; Overweight: 23.0 – 24.9 kg/m^2; Obesity: >25 kg/m^2 [4].
Obesity causes increased resistance to the passage of air throughout breathing due to narrowing of the airways [5, 6]. It is believed that the volume of blood in the lung leads to congestion, resulting in thickening of the airway wall, thereby decreasing the size of the airways [7]. Therefore, the present study was designed to evaluate the impact of obesity on peak expiratory flow rate of young adult*s* in Mumbai.

Materials and Methodology
In this study, 90 subjects were enrolled from our institute of age group of 18-22. The study protocol was ethically approved by the institutional ethical committee and the informed

consent of the volunteers was taken. Medical information was obtained through a standardized questionnaire, which include subjects' medical history, dietary history, uses of drugs, personal habits such as cigarette smoking and were screened for general physical health. Individuals suffering from respiratory diseases, hypertension and Diabetes Mellitus were excluded.

The selected groups of subjects were categorized into normal weight, overweight and obese based on Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management in JAPI vol 57, Feb 2009 categorization of body mass index. [4]

Obesity was classified according to BMI, and participants were labelled as normal for BMI between18 and 22.9, overweight for BMI between 23 and 24.9, and obese for BMI > 25 [4].

Anthropometric measurements such as height and weight were recorded. Height was measured to the nearest 0.5 cm with the help of a height scale. The body weight was measured by a weighing scale in kilograms without shoes, the subjects wearing light weight clothes. Body mass index was calculated using Quetelet formula BMI = weight in kilograms / height in m^2.

A complete spirogram was performed with computerized spirometer. The test was carried out in a quiet room, in a sitting position with the nose clip held in position on the nose. The flow, volume/ timed graphs were taken out in accordance to the criteria based on the American Thoracic Society. The subject was instructed to take a deep breath until the lungs were full and then blow out through mouth as forcibly and as fast and as long as possible till his maximum capacity, sealing the lips tightly around a clean mouthpiece. Force and best of the three acceptable curves was selected as the recording. Spirometeric parameters recorded for analysis were Peak Expiratory Flow Rate (PEFR).

Results

The values obtained in both study and control groups were expressed as mean ± Standard deviation. Student's unpaired't'- test was done to compare the means between group I with group II and group III. A *p* value of < 0.05 was considered as statistically significant.

	Group I	Group II	Group III
Age in years	18.33 ± 0.84	18.06 ± 0.25	18.16 ± 0.37
BMI(Kg/m2)	20.27 ± 1.52	23.97 ± 0.538	27.88 ± 1.67
Weight(kg)	55.66 ± 6.845	62.03 ± 4.69	76.7 ± 9.73
Height(m)	1.655 ± 0.0866	1.608 ± 0.059	1.656 ± 0.0915

Comparison of PEFR

Table 1: Comparision of PEFR Three groups of subjects studied Result are presented in Mean ± SD (Min-Max)

PEFR [L/s]	**observed**	**predicted**	**% predicted**	***p*-value**
Group I (normal)	7.96 ± 0.93 (6.45 -9.51)	9.477 ± 0.917 (7.2- 10.4)	84.07 ± 5.95 (73.63- 93.14)	>0.10
Group II (overweight)	8.016 ± 0.78 (7.12 -9.51)	8.82 ± 0.98 (7.1 -10.3)	91.33± 7.187 (73.15 -108.13)	0.001 *
GroupIII (obese)	7.858 ± 0.95 (5.79-10.01)	9.742 ±0.72 (7.1 -11.2)	80.54 ± 6.39 (67.84 -95.33)	>0.10

* *p*-value <0.05 statistically significant

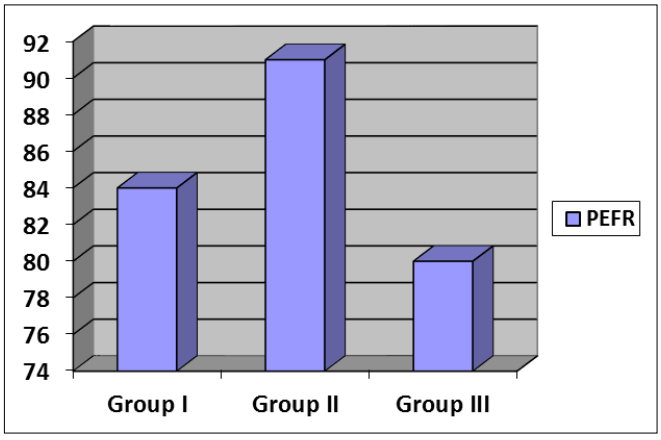

Fig 1: percentage predicted value of PEFR of different BMI groups

Discussion

Higher BMI is associated with both fat mass and muscle mass. Incerased BMI adversely affects the lung functions in our study. Most studies have reported that greater muscle mass favor better lung functions [8] as in group II (overweight) PEFR finding in our study. It has been reported that reduction of PEFR suggest the presence of peripheral air flow limitation in obese males [9]. Airway resistance dependented on elastic recoil of lung. This tends to increase the airway caliber at high lung volumes and to reduce it at low lung volumes. In addition, closer of small peripheral airway may participate in the increase of resistance to flow of air. Enright *et al* reported that maximum inspiratory and expiratory pressure which are indices of strength of diaphragm, strength of abdominal and intercostal muscles decrease in obesity [10]. Emigril and Sobol reported increase airway resistance in obese subjects and decrease after weight reduction. Briscoe and Dubois showed that airway conductance was linearly related to lung volumes. Studies showed that PEFR significantly below normal in obese due to increase in proximal airway resistance but only minimal distal airway obstruction.

It is not known whether fat is present in the airways of obese people or has any direct effect on airway structure, but studies of diet-induced obesity in rats have reported changes in lipid deposition in the lungs [11], which may affect surfactant function [12]. There is some evidence that peripheral airway obstruction may be increased in the obese, since the frequency dependence of resistance increases with increasing obesity. [2])

Conclusion

Obesity has reached epidemic proportions globally and is a major contributor to the global burden of chronic disease and disability. In present study it was seen that there is impairment of the peak expiratory flow rate in the obese population. Proper and timely advice on weight reduction will also help in prevent respiratory complications.

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