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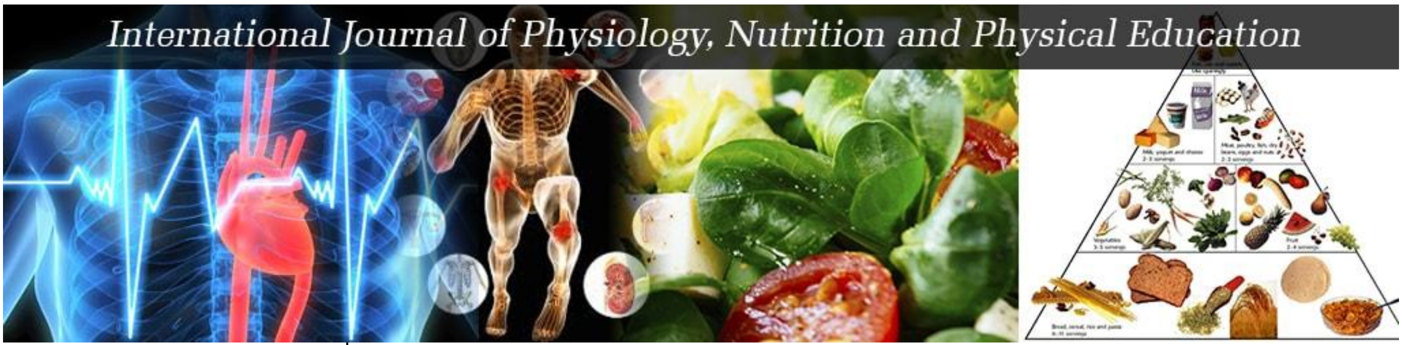

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Body mass index and maximum mid expiratory flow rate in young Adults

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Abstract
Excessive body weight may cause impaired pulmonary function and can lead to a restrictive or occasionally an obstructive pulmonary disorder. The obese subject presents damage to the respiratory mechanics causing adverse effects on the pulmonary function such as increase of the respiratory work and reduction of pulmonary volumes. [10] 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. FEF25-75 (maximum mid expiratory flow rate) was recorded by computerized spirometer. Result shows that FEF25-75 was less in obese as compared to normal weight subjects. Forced expiratory flow (FEF$_{25-75}$) or the mid expiratory flow, is the flow (or speed) of air coming out of the lung during the middle portion of a ***F***orced vital capacity (FVC) and indicates the function of the small airways. [17]This shows that with increased in BMI will affect the flow of air in small airways.

Keywords: BMI, FEF 25-75, obese, FVC, overweight

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 maximum mid expiratory flow rate of young adults in Mumbai.

Materials and Methodology

In this study, 90 subjects were enrolled from our institute of age group of 18-22 years. 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 label*l*ed 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 parameter Forced expiratory flow (FEF_{25-75}) or the mid expiratory flow, is the flow (or speed) of air coming out of the lung during the middle portion of a ***F***orced vital capacity (FVC) and indicates the function of the small airways [8].

Results

90 subjects in the age group of 18-22 years were considered for study. Subjects were divided into three groups: group I normal weight, group II overweight and group III obese as per BMI criteria [4].

Table 1: Comparision of Age, Height, weight and BMI in Three groups

	Group I	**Group II**	**Group III**
Age in years	18.33 ± 0.84	18.06 ± 0.25	18.16 ± 0.37
BMI(Kg/m^2)	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

The three groups were similar in age in terms of basic characteristics. Group III showed significant difference in BMI compared to group I.

Table 2: Comparision of FEF25-75 Three groups of subjects studied Result are presented in Mean ± SD (Min-Max)

FEF25-75 [L/s]	**observed**	**predicated**	**% predicated**	**p-value**
Group I	4.79 ± 0.485 (3.79 -5.51)	5.247 ± 0.678 (3.4 -6.45)	91.92 ± 7.95 (79.38 -113.82)	0.056
Group II	5.23 ± 0.32 (4.67-5.81)	5.67 ± 0.34 (4.75-6.32)	92.3*5* ± 4.78 (85.47 - 105.83)	0.0548
Group III	4.52± 0.54 (3.19 -5.43)	6.043± 0.629 (4.32- 6.67)	75.01 ± 6.869 (64.21 -97.9)	>0.10

*p-value <0.05 statistically significant

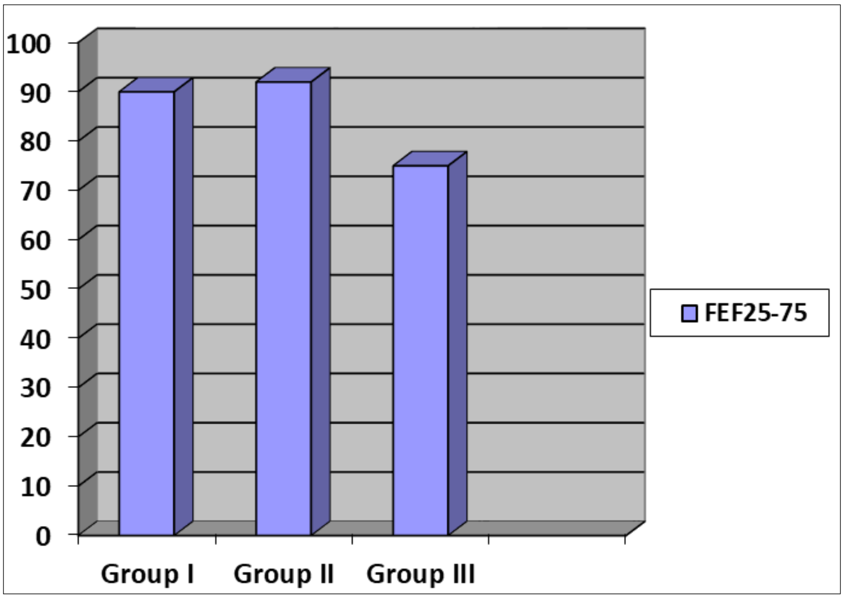

Fig 1: percentage predicted value of FEF25-75 of different BMI groups

Group I had a predicted FEF25-75 value of 5.247 while the observed value was 4.79 which was 91% of predicted value. In group II, perceived value was 5.23 which was 92% of estimated value. In group III, the observed value was 75% of the estimated value. There was a statistically non significant reduction in FEF 25-75 of group III subjects as compared to group I. However, there was no significant difference in FEF 25-75 of group I and II subjects. (Table-2, figure-1)

Discussion

Expiratory flow rates at low lung volumes (FEF25-75) may decrease with increasing obesity suggesting narrowing of the small airways [9]. But our study doesn't show any significant relation. It is possible that narrowing of the peripheral airways is associated with increased bronchial responsiveness. As in the study of Stenius-Aarniala *et al.* [11] flow rates at low lung volumes (MMEF = FEF25-75) were slightly reduced.

The spectrum of variation of lung functions may be attrubuted to mutliple mechanisms related to amount of body fat and central pattern of fat distribution. Reduction in the complaince of chest wall, work of breathing and elastic recoil of lungs [12]. Obese individuals have an increased demand for ventilation and breathing work load, respiratory muscle inefficiency, decreased functional residual capacity and expiratory reserve volume and closure of peripheral lung units. Obesity influences upper airway reflexes, lung mechanics and may affect the central control of breathing. It adversely affects chest wall mechanics, and causes decrease in total respiratory compliance due to deposition of subcutaneous adipose tissue. There is also a decrease in lung compliance due to increased pulmonary blood volume. Respiratory muscle function might be impaired in obesity due to the mechanical disadvantage. Some studies have reported that obesity not only has a significant effect on the airflow and decreasing Functional Residual Capacity and impairs respiratory physiology [13], but also increases hypersensitivity and other allergic conditions in these patients [14]. Obese patients have a lower response to treatment and asthma management is more difficult in these patients [15, 16].

References

1. WHO. http://www.who.int/gho/ncd/risk factors/overweight text/en/index.html
2. Zerah F, Harf A, Perlemuter L, Lorino H, Lorino AM, Atlan G. Effects of obesity on respiratory resistance. Chest. 1993; 103:1470-6.
3. National Institutes of Health. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults – The evidence report. National Institutes of Health. Obes Res. 1998; 6(2):51S-209S.
4. Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D *et al.* Concensus Group. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. J Assoc Physicians India. 2009; 57:163-70.
5. Salome CM, King GG, Berend N. Physiology of obesity and effects on lung function. J Appl Physiol. 2010; 108:206-11.
6. Rubinstein I, Zamel N, DuBarry L, Hoffstein V. Airflow limitation in morbidly obese subjects nonsmoking men. Ann Intern Med. 1990; 112:828-32.
7. Hogg JC, Pare PD, Moreno R. The effect of submucosal edema on airways resistance. Am Rev Respir Dis. 1987; 135:S54-6.
8. Miller MR *et al*. Standardisation of spirometry European Resp J. 2005; 26:319-338.
9. Rubinstein I, Zamel N, DuBarry L, Hoffstein V. Airflow limitation in morbidly obese subjects nonsmoking men. Ann Intern Med. 1990; 112:828-32.
10. Bosisio E, Sergi M, Di Natale B, Chiumello G. Ventilatory volume flow rates, transfer factor and its components (membrane component, capillary volume) in obese adults and children. Respiration. 1984; 45:321-6.
11. Stenius-Aarniala B, Poussa T, Kvarnström J, Grönlund E-L, Ylikahri M, Mustajoki P. Immediate and long term effects of weight reduction in obese people with asthma: randomize controlled study. BMJ. 2000; 320:827-832.
12. Lazarus R, Sparrow D, Weiss ST. Effects of obesity and fat distribution on ventilatory function. Chest. 1997; 111:891-8.
13. Mansell AL, Walders N, Wamboldt MZ, Carter R. Effect of body mass index on response to methacholine bronchial provocation in healthy and asthmatic adolescents. Pediatr Pulmonol. 2006; 41(5):434-40.
14. Kilpelainen M, Terho EO, Helenius H, Koskenvuo M. Body mass index and physical activity in relation to asthma and atopic diseases in young adults. Respir Med. 2006; 100(9):1518-25.
15. Hasan RA, Zureikat GY, Nolan BM, LaChance JL, Campe JL, Amin R. The relationship between asthma and overweight in urban minority children. J Natl Med Assoc. 2006; 98(2):138-42.
16. Ulger Z, Demir E, Tanac R, Goksen D, Gulen F, Darcan S *et al*. The effect of childhood obesity on respiratory function tests and airway hyper responsiveness. Turk J Pediatr. 2006; 48(1):43-50.
17. Miller MR *et al*. Standardisation of spirometry European Resp J. 2005; 26:319-338.