Original Research Article

Effect of Body Mass Index (BMI) on Peak Expiratory Flow Rate in young adults

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Abstract

Background: Obesity has become one of the major health issues in India. WHO defines obesity as "A condition with excessive fat accumulation in the body to the extent that the health and wellbeing are adversely affected". Obesity results from a complex interaction of genetic, behavioral, environmental and socioeconomic factors causing an imbalance in energy production and expenditure. Peak expiratory flow rate is the maximum rate of airflow that can be generated during forced expiratory manoeuvre starting from total lung capacity. The simplicity of the method is its main advantage. It is measured by using a standard Wright Peak Flow Meter or mini Wright Meter.
Aim: The aim of the study is to see the effect of body mass index on Peak Expiratory Flow Rate values in young adults.
Materials and methods: A correlational study was done 40 healthy individuals with age of 18-35 year old. Subjects having cardio or pulmonary condition were excluded. Then according to body mass index (BMI) normal (group A) and obese (group B) individuals were included. Where, BMI - normal: 18.5-22.9 kg/m^2 and obese: 25 kg/m^2 onwards. Then in sitting position all the individuals were given three trials for PEFR and best of all was taken.
Results: Group A: BMI mean -18.74±1.11and PEFR mean - 395±116.8, Group B: BMI mean - 28.7±1.12 and PEFR mean - 309±46.4. According to spearman's correlation Group A, r= 0.456 and p=0.022 also in Group B r=0.097 and p=0.342.
Conclusion: There was weak correlation in between BMI and PEFR.

Key words

BMI, PEFR, Young adults, Obese.

Introduction

The price we are paying for an affluent and developed society is a sedentary life style and faulty dietary habits which result in an imbalance between energy intake and energy expenditures, which in turn leads to obesity. Gibson, et al. and Rubinstein, et al. stated that obesity impairs the respiratory functions by inducing airway hyper-responsiveness in adults [1, 2] whereas Young, et al. linked it with the development of asthma [3].

The present study was undertaken to assesses and correlate the obesity and pulmonary functional status in obese and non-obese male and female subjects. Pulmonary functional status was assessed by recording peak expiratory flow rate (PEFR). PEFR was selected because it is widely accepted as a reliable parameter of pulmonary functions and is simple to perform as a bed-side test. Hadorn introduced PEFR in 1942 and it was accepted as a parameter of pulmonary function test (PFT) in 1949 [4-6]. The truncal fat may compress the thoracic cavity and restrict the diaphragmatic movement resulting in reduced vertical diameter of the thoracic cavity [7]. These changes may reduce the compliance of the lungs and the thoracic cavity and increase the load on the respiratory muscles. This may end up with the reduction in lung volumes and flow rates, especially PEFR [8].

Null hypothesis: There is no correlation between BMI and PEFR.
Hypothesis: There is correlation between BMI and PEFR.

Materials and methods

The sample size of the study was forty subjects. Two groups were made group A – BMI normal 18-21.9 kg/m^2 and group B - BMI obese: 25 onwards.

Inclusion / Exclusion criteria
All were healthy subjects without any medical illness like cardio-respiratory and neurological diseases or endocrinal and allergic disorders and none of them were on medication for any ailments. Subjects with habit of smoking and alcohol consumption were not included in the study.

Ethical clearance was obtained from the Institution and informed consent was obtained from all subjects.
Age group: 18 to 25 years
Gender: Both

Peak Exploratory Flow Rate Procedure
Using Wright's peak flow meter PEFR was evaluated. The subjects were instructed to take maximum inspiration and blow into the mouthpiece as rapidly, forcefully and completely as possible. They were trained well to blow into the instrument maintaining a tight sealing between the lips and mouthpiece of the peak flow meter. Standing height was recorded without shoes, with light clothes on a wall by measuring tape. Weight was recorded without shoes and with light clothes on a weighing machine. Body mass index was calculated a BMI=weight in kg / height in m^2.

Results

Group A: BMI mean -18.74±1.11and PEFR mean - 395±116.8
Group B: BMI mean -28.7±1.12 and PEFR mean - 309±46.4

According to spearman's correlation Group A **r= 0.456** and **p=0.022** also in
Group B **r=0.097** and **p=0.342 (Table – 1, Figure – 1)**

Table – 1: The mean values of BMI and PEFR of two different groups.

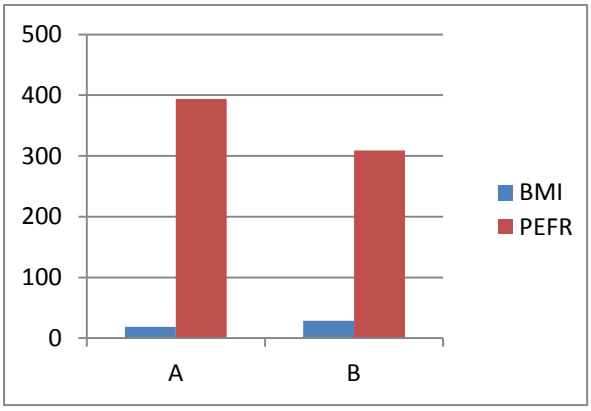
Groups	A	B
BMI	18.8	28.7
PEFR	395	309

Discussion

Our study shows that increase BMI decrease PEFR values. Obesity is a condition in which a

person has excess body weight relative to other people of the same gender and height.

Figure – 1: The graph shows the difference between the two groups (A, B) with their respective values.



Respiratory problems are associated with obesity and these occur when the added weight of the chest wall squeezes the lungs and causes restricted breathing. It is generally accepted that increased body mass loading of the respiratory apparatus (chest and. lungs) plays a role in the development of respiratory failure by causing either an insurmountable load to the respiratory muscle or significant ventilation perfusion inequalities.

A study by Saxena, et al. suggested that obesity itself and specially the pattern of body fat distribution have independent effects on PEFR [9]. You chen, et al. showed that abdominal fat is negatively and consistently associated with pulmonary function [10]. N.K. Mungreiphy, et al. found PEFR to be maximum among subjects with normal BMI, followed by overweight and obese [11]. Jones, et al. also found that the reduction in PEFR is proportional to the increase in BMI [12]. So, our study is an attempt to bring awareness about variation of lung function with increase BMI. The information may help to acknowledge the pulmonary health risks that crop up with increasing body mass index and fat accumulation.

So our study is an attempt to bring awareness about the variation of lung function with increase BMI. The information may help to acknowledge the pulmonary health risk that crop up with increasing Body Mass Index and fat accumulation.

Conclusions

There is a positive weak correlation in between BMI and PEFR. BMI affects PEFR. Early identification of risk individuals prior to the onset of disease is imperative in our developing country. Future study with larger sample size to compare pulmonary function relation with the obesity will give more insight into effect of obesity on pulmonary function.

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