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Study the Effect of Body Mass Index [Bmi] On Peak Expiratory Flow Rate [Pefr] In 20 -30 Years Age Group

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Abstract:
Background: *Obesity is an increased body weight caused by excessive accumulation of fat cells measured as body mass index [BMI]..*
Peak expiratory flow rate refers to the maximum flow rate achieved during a single forced expiration.
Objective: *To study the effect of body mass index on peak expiratory flow rate in 20 -30 years age group.*
Materials and Methods : The place of a study was done in tertiary health care centre for the period of 6 months (July 2012 to January 2013).
Study was performed on 60 females age group 20 -30 years, categorised as normal weight BMI =18.5 -24.99 kg/m^2 and over weight BMI =25-29.99 kg/m^2 . There were 30 normal weight BMI and 30 over weight BMI. The normal PEFR value for healthy young women [aged 20-30 years] is 280 -400 L/min.
Using Wright's peak flow meter PEFR was evaluated.
BMI=weight in kg / height in m^2. "t test" was used for statistical analysis.
Result: *The correlation co-efficient in over weight to found to be -0.96733.So there is some negative relation between BMI specially abdominal obesity causes decrease in PEFR.*
Conclusion: *BMI specially abdominal obesity affects PEFR*
Key Words: *BMI , PEFR.*

I. 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. Obesity may be defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size(hypertrophic obesity) or an increase in fat cell number(hyper plastic obesity) or a combination of both.[1] Obesity is often expressed in terms of body mass index(BMI).However, obese individuals differ not only in the amount of excess fat that they store, but also in the regional distribution of that they store, but also in the regional distribution of that fat within the body. The distribution of fat induced by the weight gain affects the risk associated with obesity, and the kind of disease that results.It is usefull therefore, to be able to distinguish between those at increased risk as a result " abdominal fat distribution" or a" android" obesity from those with the less serious" gynoid" fat distribution, in which fat is more evenly and peripherally distributed around the body.[2]As obesity is a key risk factor in natural history of other chronic and non-communicable diseases.The first adverse effects of obesity to emerge in population in transition are hypertension,hyperlipidaemia and glucose intolerance,while coronary heart disease and the long term complications of diabetes, such as renal failure begin to emerge several years (or decades) later.[3] Body mass index(BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by square of the height in metres (kg/m^2)

Classification	BMI	Risk of co morbidities
Underweight	<18.50	Low(but risk of other clinical problems increased)
Normal range	18.50-24.99	Average
Over weight	≥25.00	
Pre obese	25.00-29.00	Increased
Obese class I	30.00-34.99	Moderate
Obese class II	35.00-39.99	Severe
Obese class III	≥40.00	Very severe

CLASSIFICATION OF ADULTS ACCORDING TO BMI:[4]

Obesity results from a complex interaction of genetic, behavioral, environmental and socioeconomic factors causing an imbalance in energy production and expenditure. [5] Gibson et al and Rubinstein et al., stated that obesity impairs the respiratory functions by inducing airway hyper-responsiveness in adults.[6,7] whereas Young et al linked it with the development of asthma.[8]

Weight and body mass index (BMI) are used as the measures of overall adiposity whereas waist hip ratio (WHR) and waist circumference (WC) are used as the measures for abdominal obesity .[9] Overall adiposity is considered as predictors of pulmonary functional status [6] whereas the abdominal obesity is believed to influence the pulmonary function mechanically by changing lung compliance, work of breathing and the elastic recoil .[10,11,12,13]

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.[14,15,16,17] The truncal fat may compress the thoracic cavity and restrict the diaphragmatic movement resulting in reduced vertical diameter of the thoracic cavity.[18] 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 .[19]

OBJECTIVE: To study the effect of body mass index on peak expiratory flow rate in 20 -30 years age group.

II. Materials And Methods

Subjects and Study Area:

The place of a study was done tertiary health care centre, in Assam, India for the period of 6 months.(July 2012 to January 2013) Study was performed on 60 females age group 20 -30 years, categorised as normal weight BMI =18.5 -24.99 kg/m^2 and overweight BMI =25-29.99 kg/m^2 . There were 30 normal weight BMI and 30 over weight BMI. The normal PEFR value for healthy young women [aged 20-30 years] is 280 - 400 L/min.[20]

Selection of Subjects:

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 the habit of smoking and alcohol consumption were also not included in the study.[21] Ethical clearance was obtained from the Institutional Ethical Committee and informed consent was obtained from all the subjects after explaining the procedure thoroughly and giving the assurance that they could withdraw from the study whenever they wanted.

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. Three measurements were obtained consecutively from the subjects at about two minute intervals and the best of three values was taken into account. 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. WC(waist circumference), measurement was done in erect posture with the feet apart by 25 to 30 cm on light clothing, using a measuring tape at the level of umbilicus. HC(hip circumference) was measured at the widest part of the buttocks with the legs and feet together. Measurement was done in erect posture with the feet apart by 25 to 30 cm on light clothing, using a measuring tape at the level of umbilicus. HC was measured at the widest part of the buttocks with the legs and feet together. Body mass index was calculated a
BMI=weight in kg / height in m^2. "t test" was used for statistical analysis.

III. Result

Statistical analysis shows that there is significant correlation between normal PEFR and BMI.[$p<0.05$].The correlation co-efficient in over weight to found to be -0.96733.So there is some negative relation between BMI specially abdominal obesity causes decrease in PEFR.

Here normal mean BMI IS 21.658 kg/m^2 and mean PEFR IS 349 L/min (Table-1), overweight mean BMI IS 27.656 kg/m^2 and mean PEFR 256 L/min (Table-2).

TABLE1 –Normal mean BMI (kg/m^2) and mean PEFR (L/min)

Figures And Tables:

TABLE1 –Normal mean BMI (kg/m²) and mean PEFR (L/min)

BMI	PEFR
21.658	349

TABLE 2- Over Weight mean BMI (kg/m²) and mean PEFR(L/min)

BMI	PEFR
27.656	256.83

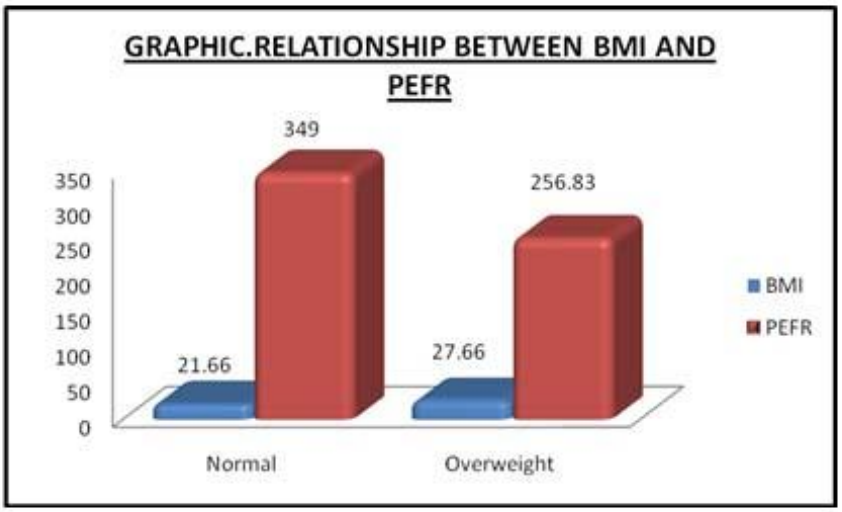

Fig 1- Wright's peak flow meter.

IV. 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. 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 suggest that obesity itself and specially the pattern of body fat distribution have independent effects on PEFR.[22] You chen et al) showed that abdominal fat is negatively and consistently associated with pulmonary function.[23] N.K. Mungreiphy et al found PEFR to be maximum among subjects with normal BMI ,followed by overweight and obese.[24] Jones et al also found that the reduction in PEFR is proportional to the increase in BMI.[25.]

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.

V. Conclusion

BMI specially abdominal obesity affects PEFR.

BMI between 25 and 30 kg/m2 should also be viewed as medically significant, especially in the college-going age group and may be considered for therapeutic intervention. Moreover the early identification of at risk individuals,prior to the onset of disease is imperative in our developing country. Future research with larger sample size to compare the pulmonary function relation with obesity will give more insight into effect of obesity on pulmonary function.

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