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EFFECT OF OBESITY ON VENTILATOR FUNCTION OF MEDICAL STUDENTS

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ABSTRACT

Introduction: Obesity is a disorder of energy balance contributing foraltered respiratory functions**.** **Method:** A total of 30 non obese and 30 obese medical students in age group of 18-25 years who have satisfied inclusion and exclusion criteria and have consented to participate in study were enrolled. Each enrolled subjects height, weight and baseline blood pressure (BP) was recorded and evaluation of ventilatory function was done using Wright's peak flow meter.

Result: There was significant decline in ventilatory functions in obese normotensive as compare to non obese students. In long term we can conclude that obesity adversely affects lung functions and which is controlled adequately if active interventions are taken. (Weight reduction, life style changes and physical exercise) to prevent obesity related respiratory sequelae in future.

Keywords: BMI, peak flow meter,ventilator functions

INTRODUCTION

Obesity is an individual clinical condition, which is increasingly being viewed as a seriouspublic health problem.Obesity develops when energy intake exceeds energy expenditureover time, leading to accumulationof adipose tissue with a corresponding increase in lean bodymass (from the necessarily enlarged muscle,bone and connectivetissue). It is important to recognize that even a small dailyenergy imbalance eventually results in significant weight gain;Prevalence of overweight and obesity is increasing in adolescents in India which is a concern in terms of the complications being seen in the later stage of life if not taken care of in time[1,2,3,4]Obesity is a life style disease. With advent of civilization, civilized men have free access to food on the table without any limitation and no physical activity is involved in procuring food. Over the years, accumulation of energy as fat resulted in high prevalence of obesity. This can be called as a "Disease of 21st century" and acts as a base for many other diseases like hypertension, dyslipidemia, and coronary artery disease [5] Obesity can profoundly alter pulmonary function and diminish exercise capacity by its adverse effects on respiratory mechanics, resistance within the respiratory system, function of respiratory muscles, work and energy cost of breathing, control of breathing, and gas exchange. Obesity places the patient at risk of aspiration pneumonia, pulmonary thromboembolism and respiratory failure. It is the most common precipitating factor for obstructive sleep apnea and is a requirement for the obesity hypoventilation syndrome, both of which are associated with substantial morbidity and increased mortality [6]. Hence respiratory systems have been reported to be major system reflecting the adverse effects of obesity.

Peak expiratory flow rate is measure of maximum rate of air flow during a sudden forced expiration. It indicates largecentral airway obstruction.It is a simple and fundamental test to measure dynamic

lung volumes to diagnosis and assess of airways disease [7].

In the current study we are going to stress on the correlation between obesity and associated alterations in respiratory functions.

MATERIAL AND METHOD

Study Design: 60 Students in the age group 18-25 years were randomly selected to obtain mixed group of students from M.G.M. Medical College and were screened to identify the 1) Non obese group: healthy with BMI<23Kg / $m^2$and 2) Study group (obese): healthy with BMI >23 Kg/m^2.

Table 1: Classification of obesity based on measurement of BMI according to WHO [8]

Normal --	18.5-22.9
Average Overweight	-- > 23
At risk --- --Increased	23-24.9
Obese –I – Moderate	---25-29.9
Obese – II Severe	>30

METHOD

Inclusion criteria included 1) Students in the age group of 18-25 years. 2) Students who are obese to their respective age and sex were selected. 3) 30 obese students and 30 non-obese students were selected according to the parameters mentioned. Exclusion criteria were 1) The exclusion criteria comprised of students suffering from any medical ailments. 2) Anxious, apprehensive and uncooperative students. 3) Any history of smoking, addiction of tobacco, use of any medications to be excluded from the study. Institutional ethical clearance was obtained. Bodymass index was calculated as per the formula:

Body mass index = Weight (Kilograms)/Height (Meter^2).

The students having BMI of more than the cut-off value for their respective age and sex were designated as the test/obese group (both overweight and obese students to be clubbed together). Identical number of age and sex matched non-obese medical students served as controls.Students were explained about the procedures to be undertaken. A brief personal history was taken and written consent was obtained as per Helinski declaration modified according to the test protocol

The subjects were made to rest for 10 min before recording their baseline systolic and diastolic blood pressure along with mean blood pressure as per standard procedure.

Respiratory parameters (lung function tests)

Peak expiratory flow rate was measured using advanced computerized spirometer according to standard procedure.

Peak expiratory flow rate (PEFR): the subject was made to sit upright on chair. After taking a deep breath was made to hold mouth piece in his mouth, gripping it tightly with his teeth and his lips and blow hard as possiblein a short sharp blast. Three readings were taken after adequate period of rest between each attempt and maximum value was recorded.

Statistical analysis: Results were analyzed by using Unpaired Student T-test with "P" value < 0.05 for significance.

RESULTS

60 subjects (group A non obese n-30) and (group B obese n-30) that have satisfied the inclusion and exclusion criteria were selected.

Table 2: Comparison of height, weight, B.M.I. in groups

Groups	Height (mean±SD)	Weight (mean±SD)	BMI (mean±SD)	Baseline diastolic BP (mean±SD)
Goup A	169.9±12.89	55.00±9.396	19.09+2.652	74.07±3.463
Group B	163±13.19	78.50±9.641	30.12±6.356	82.13±5.680

Table-2 The twogroups for the study were similar in age in terms of basic characteristics. Group A and Group B showed significant difference in Height, Weight, BMI and Basal diastolic BP ($p<0.001$)

Table-3: Peak expiratory flow rate analytical values

Groups	BMI(mean±SD)	PEFR L/sec(mean±SD)	P-value
group A (n-30)	19.09 ± 2.652	9.788± 0.4263	0.0003 (significant)
Group B (n-30)	30.12± 6.356	7.722± 0.3675	

Table 3 showsPeak expiratory flow rateevaluation for Lung function assessment as follow:
Group B subjects showed significant reduction in PEF ($p<0.001$) when compared to Group A in changes from the observed values.

DISSCUSSION

In the present study, ventilatory function,peak expiratory flow rate wasestimated in normal and obese normotensive Medical undergraduate subjects in comparable age group. It was observed that there was a significant reduction PEFR in the obese normotensive subjects when compared to normal lean individuals. There was significant difference in ventilatory functions between obese normotensive and lean subjects. Our data shows that body composition and fat distribution are associated with lung function in middle-aged men, in that a central pattern of fat distribution is associated with a decrease in lung functions .The altered lung function is suggestive of an obstructive airway dysfunction. The amount of body fat and a central pattern of fat distribution might be related to lung function by several mechanisms. Mechanical effects of diaphragm to impeding its descent.Reduction in compliance of chest wall, work of breathing and elastic recoil of lungs [9]. Adiposity and visceral fat tend to increase with age [10]. Enright PL et al reported that maximal inspiratory and expiratory pressures which are indices of strength of diaphragm and strength of abdominal and inter costal muscles decreased in obesity.Abdominal fat deposition may directly impede the descent of the diaphragm where as fat deposition in the chest wall may diminish rib cage movement and thoracic compliance, both of which lead to restrictive impairment of respiration. Other mechanisms include the possibility that abdominal fat deposition leads to redistribution of blood to the thoracic compartment that reduces vital capacity (VC). [11]In obese subjects the diaphragm is in the upper position, which results in a low functional residual capacity (FRC). Such modification in resting end expiratory lung volume may result in a passive change in airway resistance related to an increasing in transmural pressure across the bronchial wall. In addition, chest wall resistance and increased respiratory resistance could also be due to existence of upper airway obstruction and fat deposition or lax pharyngeal muscle tone in obesity.[12]

CONCLUSION

Obesity is important risk factor for the pathophysiologic changes contributing for altered ventilatory functions in obese subjects in comparison to non obese subjects. In long term we can conclude that obesity adversely affects ventilatory functions and which is controlled

adequately if active interventions are taken. In our study it was observed that obese normotensives exhibit a significant decline in lung functions like PEFR, when compared to normal subjects.

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