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Original Research Article

A Comparative study of pulmonary function test and body mass index in young adult males of B. G. Nagara

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Abstract: Obesity is becoming a serious public health issue related to lung dysfunction. Prevalence and severity of obesity in young adults is increasing worldwide. Obesity is an important health problem in developing countries particularly in India. Hence the present study was planned to assess the correlation of pulmonary functions with increasing BMI in young adult males. This study was conducted to determine the effect of increase in BMI on pulmonary function test parameters like FVC, FEV1and PEFR in the young adult male population of B.G .NAGARA**.** The present study was a comparative study consisting of 120 male subjects (60 study and 60 control groups) in the age group of 18-24 years. This study was conducted in the Department of Physiology, Adichunchanagiri institute of medical sciences, B.G.Nagara, Nagamangala taluk, Mandya district, after the institutional ethical clearance and written consent from each participant. FVC, FEV1and PEFR was recorded in both the study and control groups. The parameters thus recorded was analyzed for statistical significance using Students't' test and $p < 0.05$ was considered the level of significance. FVC, FEV1and PEFR were significantly decreased at ($p < 0.001$**) in the study group (Over weight) as compared to the control group (Normal group).The results of this study indicate that pulmonary function test is decreased in individuals with increased BMI.
Keywords: FVC - Forced Vital Capacity, FEV1 – Forced Expiratory Volume in 1st second, PEFR – Peak expiratory flow rate and BMI-Body mass index

INTRODUCTION

Overweight and obesity has become a major health issue nowadays in the developed and developing countries. Obesity in children and adult is increasing in alarming proportion in the world [1]. Obesity is a chronic medical condition characterized by an excessive accumulation of fat on the human body that causes a generalized increase in the body mass [2].The range of weights for individuals if greater than the ideal weight, is termed either overweight or obese [3]. Obesity has become a global epidemic and it is still increasing in both industrialized and developed countries [4]. At least 1 billion people worldwide are estimated to be overweight and at least 300 million people are estimated to be obese [5].Obesity, defined as excessive fat tissue, contributes to the development of several systemic diseases and higher mortality. Obesity may affect several body systems and therefore lead to higher morbidity and mortality rates in the population [6].The prevalence of obesity around the world is monitored by world health organization on body mass index. As of November 2014, the database has complied data covering approximately 86% of adult population worldwide. The WHO estimates that 2015 approximately 1.6 billion people worldwide were overweight and that at least 400 million adults were obese [7]. According to Gabrielsen AM et al, obesity may cause adverse effect on the respiratory system due to alterations in the gas exchange, respiratory mechanics, muscle endurance and respiratory control. They further project that these effects may be linked to varieties of co-morbidities such as pulmonary hypertension, diastolic dysfunction and coronary heart disease. They also state that obesity may lead to respiratory failure known as obesity hypoventilation syndrome [8]. Krishman Parameshwaran et al, in their study of altered respiratory physiology state that major complication of obesity includes a heightened demand for ventilation, elevated work of breathing, respiratory muscle inefficiency and diminished respiratory compliance [9].

The present study is designed to determine the effect of increase in BMI on pulmonary function test parameters.

METHODOLOGY

Subjects were healthy volunteers in the age group of 18 – 24 years who were selected randomly from the general population of B.G NAGARA. All the subjects were non- smokers and were not on any medications. Those already performing some form of yoga or breathing exercises were excluded from the study. Individuals suffering from any respiratory diseases such as COPD, bronchiectasis, interstitial lung disease, upper & lower respiratory tract infections that might affect the pulmonary function were also excluded from the study.

The study was prior reviewed and approved by the Institutional ethical committee. Each subject gave a written consent before participating in the study.

A sample size of 120(60 normal & 60 overweight young adults based on WHO criteria of body mass index as mentioned below).

Table-1: WHO criteria of body mass index

BMI (KG/M^2)	Category
18.5-24.99	Normal weight
25-29.99	Over weight
30 and above	Obese

The number of subjects was calculated based on the results of a pilot study done on similar subjects.

1) Height – The standing height was measured in centimeters nearest to 1 cm with a measuring tape attached over a wall. While measuring the height, the subject removed their shoes and stand with their heels together.

2) Weight – Weight was measured in kilograms in empty bladder and empty stomach on a standardized digital weighing machine nearest to 0.1 Kg.

3) BMI – BMI was calculated based on the Quetelets Index [10]

BMI =Weight (in Kgs) /Height ^{2} (in meters)

Pulmonary function test was recorded using a computerized spirometer – BPL ARPEMIS version 3.1 between 8-9AM. Statistical analysis of the data obtained was done using Student-'t' test, and other relevant statistical tools.

RESULTS

The parameters thus recorded were analyzed for statistical significance using Students't' test and $p < 0.05$ was considered the level of significance. FVC, FEV1and PEFR were significantly decreased at ($p < 0.001$**) in the study group as compared to the control group.

Table-2: Comparision of Pulmonary function test in the Study group (Normal weight) & Control group (Over weight)

Parameters	Control group (Normal weight)	Study group (Over Weight)	P value
FVC (L)	2.53±0.59	2.1±0.7	<0.001
FEV1(L)	1.67±0.51	1.21±0.59	<0.001
PEFR (L/min)	75.32±19.2	58.71±19.76	<0.001

DISCUSSION

The present study showed that FVC, FEV1and PEFR were significantly decreased at ($p < 0.001$**) in the study group (Over weight) as compared to the control group (Normal weight).Obesity was the likely cause of pulmonary function decline. Pulmonary function is determined by the movement of lungs, chest wall, muscles and diaphragm. Since in obesity decent of diaphragm into the abdominal cavity is restricted due to deposition of fat, this restriction of movement is the major reason for lung dysfunction. This fat deposition also restricts the rib cage movement which in turn decreases the compliance & elastic recoiling of the lungs. The abdominal fat deposition also leads to redistribution of blood flow to the thoracic compartment which results in reduced vital capacity. Airflow resistance is also increased due to the deposition of fat which is other reason for decline in pulmonary functions. The results of the present study was consistent with the study done by Chen *et al*. [11] were waist circumference and BMI as a measure of obesity, compared the pulmonary function in normal weight, overweight and obese subjects. They observed that there was a negative association between BMI and FVC in over weight and obese subjects as compared to the normal subjects

CONCLUSION

The findings of our study suggests that over weight has a negative association with the pulmonary functions

Limitations of the study-The limitations of the present study were less number of the subjects.

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