A cross-sectioal study among obese and non-smoker participants of North Indian Population

Sonu Kumar
Assistant Professor, Department of Physiology, Maharshi Devraha Baba Autonomous State Medical College, Deoria (UP)

Piyush Kumar Mishra
Tutor, Department of Physiology, Maharshi Devraha Baba Autonomous State Medical College, Deoria (UP)

Abhinav Kumar Mishra
Assistant Professor, Department of Anatomy, Hind Institute of Medical Sciences, Ataria, Sitapur (UP)

Naveen Tiwari
HOD, Department of Physiotherapy, Hind Institute of Medical Sciences, Ataria, Sitapur (UP)

Abstract

Background: The worldwide obesity epidemic is a serious public health concern that is linked to a number of dangers, including detrimental effects on the respiratory system. Even in the absence of obvious lung illness, those who are overweight or obese are more prone to experience respiratory problems than those with a healthy body mass index (BMI). Research has also demonstrated a rise in self-reported dyspnea and wheeze in obese individuals compared to lean individuals during rest and during physical activity. Even in the absence of obvious lung illness, those who are overweight or obese are more prone to experience respiratory problems than those with a healthy body mass index (BMI). While attempting to pinpoint the precise role that obesity plays in the emergence of respiratory issues, several concurrent medical diseases may also occur. Obesity has been proven to affect the functionality of the respiratory muscles. Respiratory muscles may get overworked if there is a mix of heavy breathing and a decline in function. This could contribute to an increased need for oxygen for ventilation and heighten feelings of being out of breath.

Aim and Objective: To find out the correction between BMI and Lung volumes on obese and normal population.

Materials and Methods: The data collection has been done in the Department of Physiology, MDBASMC, Deoria (U.P.) after prior consent from the participants of 100 (n=50 Normal males & n=50 Obese Males) by the help of manual spirometry and match with the digital one. The BMI calculation done by after measuring the height and weight of individuals.

Observation & Results: The frequency (f) and percentage (%) of taken parameters calculated as 16 (32%), 16 (32%), 08 (16%), 05 (10%), 03 (6%) and 02 (4%)were found in the average person age group 18–20,

21–23, 24–26, 27-29, 30-32 and 33–35. The Mean ± SD of given parameters were found that increase in BMI level significantly as 29.02 ± 4.62 in obese individuals as compared to the BMI level 22.52 ± 2.02 in normal participants. There was insignificant correlation found among FEV1 in normal participants and FEV1. However, the FEV1/FVC ratio in obese males as compared to the FEV1/FVC in normal males was significantly correlated as P = 0.0001 while FEF25-75% and PEFR are comparably correlated among normal males and obese males.

Conclusion: The study found a strong correlation between PFT and obesity. It was also concluded that there is significant increase in the FEV1/FVC ratio. There is increment of IRV values to keep vital power constant. From this study it is further concluded that BMI is not the unique indicator for PFT.

Keywords: *Obesity, Vital Capacity; Expiratory Volume, Pulmonary Function Tests.*

INTRODUCTION

The worldwide obesity epidemic is a serious public health concern that is linked to a number of dangers, including detrimental effects on the respiratory system. It is predicted to continue to expand over time. [1] Even in the absence of obvious lung illness, those who are overweight or obese are more prone to experience respiratory problems than those with a healthy body mass index (BMI). Research has also demonstrated a rise in self-reported dyspnea and wheeze in obese individuals compared to lean individuals during rest and during physical activity. Even in the absence of obvious lung illness, those who are overweight or obese are more prone to experience respiratory problems than those with a healthy body mass index (BMI). Research has also demonstrated a rise in self-reported dyspnea and wheeze in obese individuals compared to lean individuals during rest and during physical activity. [2,3] The obesity issue offers a new danger to people with serious respiratory illnesses, worry medical professionals. [4] Obesity is thought to significantly affect pulmonary function, [5] among obese patients, respiratory problems necessitating pulmonary function tests (PFTs) are frequently noted. It has been demonstrated that obesity lowers lung volume and capacity via reducing lung and chest wall compliance. [6] Obesity may be accompanied by clinical respiratory symptoms such lower compliance, higher airway resistance, decreased lung capacities, and altered breathing and gas exchange. [6,7] Adults' lung volumes and obesity have an inverse relationship, which may indicate that obesity causes a restrictive lung deficit. [8,9] Symptoms of respiratory disorders include dyspnea, chronic obstructive pulmonary disease (COPD), asthma, and obstructive sleep apnea are all directly correlated with obesity. While attempting to pinpoint the precise role that obesity plays in the emergence of respiratory issues, several concurrent medical diseases may also occur [10]. [11] Obesity has been proven to affect the functionality of the respiratory muscles. Respiratory muscles may get overworked if there is a mix of heavy breathing and a decline in function. This could contribute to an increased need for oxygen for ventilation and heighten feelings of being out of breath. [12] Weight loss has been proven in studies to improve dyspnea management and the recovery of respiratory muscle function. [13] It is common knowledge that obesity reduces lung volume. Yet, there has never been a thorough investigation demonstrating the relationship between BMI and the various lung volumes. It is still unclear how exercising causes breathlessness in fat persons. The link between BMI and PFTs in young north Indian[15] and south Indian[16] females has recently been investigated. [16] In the central

region of India, there aren't any sizable studies demonstrating the link between obesity and PFTs in young, healthy Indian individuals. We want to know more about the relationship between lung function and being overweight or obese, as well as whether it differs among young men from Northern India. The current study assesses the connection between PFT characteristics in young boys from the Northern Indian region who are obese and normal weight.

MATERIALS AND METHODS

The total 100 participants (50 smokers and 50 non-smokers) were taken in this study after prior consent obtained from the participants of Deoria City. with the help of respirometry in the Department of Physiology, MDBASMC, Deoria (U.P) during the period of 6 months from 1st January 2022 to 30th June 2022.

The adult age group aged between 20-35 years non-smokers participants (n=50) with no lung disorders were included and the participants who have any kind of syndrome or lung disorders were excluded from this study

Measurement of BMI

The subject were asked to be standing in anatomical position and removed their shoes then measured their weight by weighing scale (in Kg) and height (in m) by Stadiometer. After that the BMI (kg/m2) was calculated by formula given by WHO standard.

Measurement of the Pulmonary Function Test

The pulmonary function evaluation was performed by computerized spirometer (UNILAB, India, Surface speeds in mm/sec.) [Fig. 1]. They already tested for the parameters of lung volumes, capacities, and followed all the standard measurements. The peak expiratory flow rate (PEFR) was also calculated [19] with volunteers .

Fig 1. Spirometer

Statistical Analysis

Statistical analysis was done by using Statistical Package for Social Sciences software version 21.0 (Chicago, L). Mean ± Standard Deviation (SD) was calculated from MS-Excel for all the parameters. T-test applied for comparing the two groups. Pearson's correlation coefficient (r) has been applied to find the association between the two variables in which the $P \leqslant 0.05$ was considered as significant.

OBSERVATION & RESULTS

Table 1: Parametric distribution among Normal and Obese Participants

S.No.	Age Group	Normal Males		Obese Males	
		Frequency	Percentage	Frequency	Percentage
1	18-20	16	32	08	16
2	21-23	16	32	16	32
3	24-26	08	16	14	28
4	27-29	05	10	03	6
5	30-32	03	6	04	8
6	33-35	02	4	05	10

Table 2: Spirometric parameters among Normal and Obese Participant

Parameters	Normal Weight	Obese Person	p-Value
	Mean ± SD	Mean ± SD	
Age	26.02 ± 5.09	26.33 ± 5.38*	0.040
BMI	22.52 ± 2.02	29.02 ± 4.62*	0.011
FVC	3.89 ± 0.78	2.53 ± 0.89*	0.012
FEV1	2.92 ± 0.54	2.64 ± 0.54	0.782
FEV1/FVC	71.23 ± 2.36	82.35 ± 5.21*	0.000
FEF25-75%	4.89± 1.33	4.23 ± 1.39	0.079
PEFR (L/sec)	6.25 ± 1.79	6.55 ± 1.38	0.054

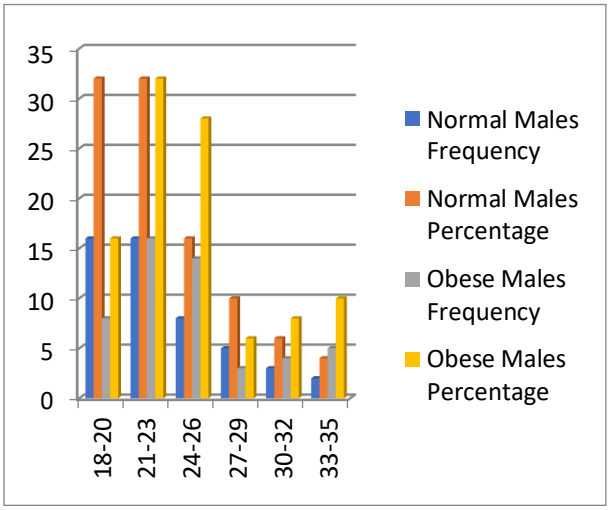
*Independent t-test

The parametric distribution of frequency (f) and percentage (%), 16 (32%), 16 (32%), 08 (16%), 05 (10%), 03 (6%) and 02 (4%)were found in the average person age group 18–20, 21–23, 24–26, 27-29, 30-32 and 33–35. The minimum frequency and percentage for the age group were 33–35, and the maximum frequency and percentage for the age group were 18–20 and 21–23. Among obsessed individuals, frequency and percentage were 08 (16%), 16 (32%), 14 (28%),03 (6%), 04 (8%) and 05 (10%). The minimum frequency and percentage for the age group were 27–29, and the highest frequency and percentage for the age group were 21-23 years.

The Mean ± SD of given parameters were found that increase in BMI level significantly as 29.02 ± 4.62 in obese individuals as compared to the BMI level 22.52 ± 2.02 in normal participants with a P = 0.01. It was also noted that the level of FVC level was significantly decreasing like 2.53 ± 0.89 in obese individuals as compared to 3.89 ± 0.78 in normal participants with a P = 0.01. There was insignificant correlation found among FEV1 in

normal participants and FEV1 in obese participants as 2.64 ± 0.54 & 2.92 ± 0.54 with a P = 0.782. However, the FEV1/FVC ratio 82.35 ± 5.21 in obese males as compared to the FEV1/FVC in normal males was significantly correlated as 71.23 ± 2.36 individuals with P = 0.0001 while FEF25-75% and PEFR are comparably correlated among normal males and obese males. The study determines that there is no impact of BMI in the changes of FVC and FEV1/FVC ratio among obese and normal participants.

Fig 2. Comparison chart of frequency and percentage distribution between Normal vs. Obese males



DISCUSSION

PFT are generally linked with the BMI of the individual. There was a significance difference found between BMI data for normal and obese participants which was proved. This refers to a person of normal weight with normal lung functioning in terms of lung compliance, lung volume, and lung capacities. It was discovered that there was a substantial difference in the FVC values between people of average weight and obese people. Because the majority of participants were in pre-obesity condition in this study, the FEV1 value between normal-weight and obese participants were comparable to that of obese people. It denotes consistent compliance of the chest wall and lungs among both people who are regular weight and those who are obese. In our research, we discovered that pulmonary function followed an erratic pattern when BMI rose. When comparing obese people to normal people, the pulmonary function test variables FVC, FEV1, FEV1/FCV, FEF25-75%, and PEFR have a negative relationship with BMI [20].

An FEV1/FVC ratio indicates that the changes found in lung diseases [21] which was functionally changes in FEV1/FCV ratio among obese individuals compared to normal weight individuals. In the patients of Egyptian population it was noted that the ratio was 28.9% of restrictive pattern, 2.8% of obstructive patterns, and 2.4% are of mixed patterns out of this in obese patients the restrictive pattern was most commonly seen [22]. In the asthmatic patients FEF25-75% was also correlated [23,24]. In the North American people [14] the effect of BMI on lung volumes along with more effective occurrence on BMI values which was <30 kg/m2 on FRC and ERV values. The use of PEFR is useful for the determination of respiratory diseases and create the distinction between obstructive and restrictive respiratory diseases [25] but due to its dependency on anthropometric variables it was found to be insignificant correlation between normal and obese participants [26]. The present study was similar with the previous study done on North and South Indian females[15,16]. The respiratory compliance observed to be reduced and seen in respiratory problems due to obesity [6,27].

CONCLUSION

We found a strong correlation between PFT and obesity. We came to the conclusion that obesity

causes major alterations in respiratory performance, as demonstrated by the considerable drop in FVC, and that an obese person's pattern of restrictive lung function is indicated by the significant increase in the FEV1/FVC ratio. These findings point to causing a compensatory increase in the IRV to keep vital power constant. Hence, a decrease in BMI has a negative impact on respiratory processes. The correlation study, however, indicates that BMI is not a negative determinant for a change in PFT in obesity. Hence, BMI is not a unique indicator for measuring the PFT. Our results will aid clinicians in understanding PFT results in patients. Understanding how to maintain a normal BMI through lifestyle and treatment changes will aid in the elimination of obesity and the impairment of pulmonary function.

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