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Original Research Article

Effect of Obesity on Lung Functions by Spirometry

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Abstract

Background: Aim is to study the impact of obesity on lung functions by spirometry tests, among healthy young adults.

Material and Methods: This work was performed on N=41 normal, healthy non-smoker females and N= 30 healthy, smoker females between 18-35 years of age. Informed consent was taken from the participants and case control study was performed. The two different groups were formed based on their BMI. In Group 1, N = 41, BMI was between 18 - 22.9 Kg/m^2. In Group 2, N = 30, obese females were enrolled with BMI more than 25 Kg/m^2. On computerized spirometer, the peak expiratory flow rate (PEFR), the forced vital capacity (FVC), forced expiratory volume (FEV_1) at the end of one second, FEV_1/FVC ratio were noted.

Results: In obese Group 2 females, PEFR data were reduced significantly in comparison to Group 1. FEV_1, FVC, FEV_1/ FVC ratio were found to be not significant.

Conclusion: Obesity decreases PEFR value among healthy female adults.

Keywords: FEV_1, Forced Expiratory Volume at the end of First Second, FVC, Forced Vital Capacity, PEFR, Peak Expiratory Flow Rate.

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Introduction

As per WHO, obesity has affected almost all age groups.[1] Obesity leads to hypertension, diabetes, obstructive sleep apnea, etc.[1] Adipose tissues produces cytokines and mediators, a pro-inflammatory condition which increases asthma, atopy, bronchial responsiveness risks in obese people.[2]

Obesity impairs pulmonary function tests by decreasing strength of respiratory muscles, pulmonary gas exchange, lung compliance and exercise capacity. Small airway dysfunction affects the expiratory flow and mechanics of breathing. [3-6] Obesity affects the diaphragm and rib movements and alters ventilation. Hence, this research work was conducted with the aim of investigating pulmonary fuctions in obese females. Spirometry tests are easy to conduct and non-invasive hence used widely as a screening test for lung functions.

Aim: To evaluate the effect of obesity on lung functions in obese females by spirometry tests.

Material And Methods

The informed consent was taken from every participant. This case control study was performed in the Dept of Physiology of Dr. BSA Medical College, Delhi from Jan 2018 – May 2019 and NSMCH, Bihta, Patna from Jan 2026 till April 2026. Subjects were divided into two different groups based on their BMI.

The body mass index (BMI) was calculated using Quetelet's formula. [BMI = weight (kg)/ height (m^2)].[7]

Inclusion Criteria: Group 1, N = 41, female subjects between age of 18-35 years with BMI between 18 - 22.9 kg/m^2 Blood pressure and the blood sugar levels were normal and N = 30, Group 2 female subjects between age of 18-35 years with BMI > 25 kg/m^2 were enrolled as obese.[8]

Exclusion Criteria: Subjects with upper respiratory infections in the past 4 weeks or surgery on chest or those who had pleural disease, chronic systemic illness, tuberculosis, chronic obstructive lung disease, coronary heart disease, restrictive disease, asthma, smokers and underweight (BMI < 18 kg/m^2) were not included in the study.

Procedure: After maximal inspiration followed by forcefully expiration of air as quickly as possible, forced expiratory volume in one second FEV1, forced vital capacity FVC, FEV1/FVC ratio, peak expiratory flow rate PEFR were recorded. Procedure was done as per American thoracic society guidelines on an electronic portable RMS Medspiror, spirometer machine. Medicare system, Chandigarh.

After 5 minutes rest, detailed procedure was explained to them. In sitting posture procedure was done. Mouthpiece was kept in subject's mouth. Nose - clip was applied on the nose. Procedure was repeated and subjects were asked to make a full expiratory and inspiratory loop as a single manoeuvre. Nose clip was applied on nose and after full rapid inspiration through the mouth piece and then expire with force maximally followed by a rapid maximum inspiration where manoeuvre was completed.

The mean and standard deviation was calculated using online student unpaired t test Graphpad calculator. P value less than 0.05 was considered statistically significant.

Statistical Analysis: Data was analysed by online GRAPHPAD QUICKCALCS student unpaired t-test. PFTs parameters were compared between Group 1 and Group 2. The statistical significance was kept at p value < 0.05.

Result

Table 1: Demographic Data of Female Subjects

Parameters	Group 1 Control (mean ± SD)	Group 2 Obese (mean ± SD)	P value
Age (years)	19.6 ± 0.94	19.2 ± 1.08	0.1(NS)
Weight (Kg)	59.17 ± 7.85	70.13 ± 7.60	0.0001(HS)*
Height(cm)	171.86 ± 4.88	170.71 ± 5.22	0.34(NS)
BMI(Kg/m^2)	20.00 ± 1.12	24.1 ± 2.62	0.0001(HS)

***Significant P < 0.05, P < 0.001**

Table 2: Spirometric Data of Female Subjects

Parameters	Group 1 Control (mean ± SD)	Group 2 Obese (mean ± SD)	P value
FEV_1 (L)	3.41 ± 0.66	3.32 ± 0.64	0.56 (NS)
FVC (L)	4.22 ± 0.53	4.20 ± 0.4	0.86 (NS)
FEV_1/FVC	81.63 ± 9.54	79.03 ± 7.65	0.22 (NS)
PEFR L/min)	517 ± 93.14	455 ± 82.16	0.004 (HS) *

***Significant P<0.05, P<0.001**

Discussion

In above study, spirometric parameters were measured for both groups and were compared. FEV1, FVC, FEV1 / FVC ratios were not significant. PEFR was decrease due to increase in the resistance of airway and was found statistically significant in obese group 2.[4] Few studies show no effect on the respiratory system while other studies show positive impact on it. Variations in ethnicity and the methodology alters PFT values. This study was restricted to the spirometric values FEV1, FVC, FEV1/FVC and PEFR. Mohammed Al Ghobain study has supported above findings. [5] Study by Devershetty et al supported above findings. A significant difference to FEV1 / FVC and PEFR was reported in obese subjects. Both parameters were decrease in obese. [6]

This could be due to decrease in total respiratory compliance.[7] Naimark and Cherniack reported decrease in respiratory compliance in obese due to increase deposition of fat around the chest and abdomen.[9] Diaphragm was shifted upward in thorax which increases work of breathing and functions of lungs were affected.[10] Chest fat restricts the expansion of lungs.[11] PEFR was reduced due to increase in resistance of respiratory system and decrease in compliance.[12] Obesity causes restrictive defect and morbid obesity restricts flow of air. The reduce lung volume collapses airways in obese.[13] Leptin hormone is an inflammatory marker of the systemic inflammation which decreases the airway diameter.[14] BMI measures fat and lean mass but the drawback is the lack of information about fat distribution in body. Fat deposited in the thigh and hip areas do not affect lung volumes directly. But the fat deposited in the abdominal and thoracic areas reduces the lung volumes directly by decreasing the chest wall and diaphragm movements. Hence, the fat distribution in body must change the relation between BMI and the lung volumes.

Conclusion

The restrictive tendency is more in obese which is reversible. Hence, obesity decreases PEFR among healthy young females. With the help of

computerized spirometry, analysis of flow-volume loops is of great help to obese subjects.

References

1. World Health Organization (WHO). Obesity and overweight. Geneva: WHO; 2003.
2. Koenig SM. Pulmonary Complications of obesity. Am J Med Sci. 2001; 321:249–279.
3. Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D, et al. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. J Assoc Physicians India 2009; 57:163–170.
4. Carey IM, Cook DG, Strachan DP. The effects of adiposity and weight change on forced expiratory volume decline in a longitudinal study of adults. Int J Obes Relat Metab Disord.1999;23(9):979-985.
5. Mohammed Al Ghobain. The effect of obesity on spirometry tests among healthy non-smoking adults, BMC Pulmonary Medicine. 2012;12:10,1-5
6. Devershetty J, Metta S, Uppala S, Kamble G. Effect of obesity on pulmonary function tests in apparently healthy young women. Intern J of Med Sci and Public Health Online 2015; 4(11):1519-1522.
7. Mishra IS, Muneshwar JN, Afroz S. To Study Body Mass Index, Waist Circumference, Waist Hip Ratio, Body Adiposity Index And Lipid Profile Level In Patients With Type-2 Diabetes Mellitus.IOSR.Volume14,Issue5Ver.III(May.2015),98-101
8. Mishra IS, Effect of Obesity on Spirometry Tests among Healthy Male Adults. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS),2019;18(1);63-65.
9. Naimark A, Cherniack RM. Compliance of the respiratory system and its components in health and obesity. J Appl Physiol 1960; 15:377–82.
10. Jones RL, Nzekwu MM. The effects of body mass index on lung volumes. Chest 2006; 130:827-833.
11. Poulain M, Doucet M, Major GC, et al. The effect of obesity on chronic respiratory diseases: pathophysiology and therapeutic strategies. CMAJ 2006;174:1293-1299
12. Costa D, Barbalho MC, Miguel GP, Forti EM, Azevedo JL. The impact of obesity on pulmonary function in adult women. Clinics (Sao Paulo) 2008;63(6):719-724.
13. Poulain M, Doucet M, Major GC, et al. The effect of obesity on chronic respiratory diseases: pathophysiology and therapeutic strategies. CMAJ 2006; 174:1293-1299.
14. Sin DD, Jones RL, Man SF. Obesity is a risk factor for dyspnoea but not for airflow obstruction. Arch Intern Med 2002, 162:1477-1481.