

Original research article

## Assessment of Pulmonary Function Test in Patients Having Tuberculosis, Asthma and COPD .

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### Abstract

**Introduction:** Respiratory illnesses were supposed to be sore for humans but considering the present day scenario critical illnesses like COVID 19 are becoming leading cause of death. But never the less antiquity of respiratory ailments can always be remembered which was governing the world of illnesses over many decades and centuries.

The deadlier variants of respiratory diseases like COPD, asthma and pneumonia are ranked at the third position in leading causes of death around the globe. For dominating these disease early detection, treatment, follow up and most importantly prevention plays the key role. For diagnosing respiratory diseases Pulmonary function tests along with clinical presentations should be of utmost priority.

Thus a study was designed to see effects on lungs caused by COPD, asthma and Tuberculosis coming to our institution which may lay a stepping stone towards management of these deadlier diseases in future

**Material and Methods:** 60 individuals were enrolled in this observational study. They were categorized into three groups. a) Tuberculosis (TB) b) Asthma, c) COPD patients. FEV1, FVC, FEV1/FVC were measured by spirometer.

**Results:** The mean  $\pm$  SD levels of FVC in asthma is ( $2.2 \pm 0.66$ ), TB ( $2.37 \pm 0.78$ ) and ( $1.5 \pm 0.58$ ) in COPD patients. The levels of FEV1 in respiratory diseases like Asthma, TB are ( $1.92 \pm 0.55$ ), ( $1.92 \pm 0.64$ ) and ( $1.09 \pm 0.45$ ) in COPD patients. The ratio between the FEV1/FVC in Asthma, TB and COPD are ( $88.0 \pm 4.52$ ,  $81.11 \pm 4.64$ ,  $64 \pm 6.79$ ) respectively. In Asthma and TB the FVC and FEV1 values are indifferent with no statistically significant of ( $p > 0.05$ ). While comparison between COPD- asthma and COPD-TB patents the FEV1 and FVC levels were changed to be statistically significant ( $p < 0.05$ ).

Data were analyzed by student ANOVA and Bonferroni's post hoc test- P value  $< 0.05$  can be considered statistically significant

**Conclusion:** It can be concluded that Spirometry of the patients with diseases like TB, asthma and COPD can lay a stepping stone in diagnosis and treatment outcomes of the patients if performed well within time which can benefit the society by reducing the disease burden.

**Keywords:** PFT, Asthma, TB, COPD.

## Introduction

Respiratory illnesses were supposed to be sore for humans but considering the present day scenario critical illnesses like COVID 19 are becoming leading cause of death.<sup>1</sup> But never the less antiquity of respiratory ailments can always be remembered which was governing the world of illnesses over many decades and centuries.<sup>2</sup>

The deadlier variants of respiratory diseases like COPD, asthma and pneumonia are ranked at the third position in leading causes of death around the globe.<sup>3</sup>

For dominating these disease early detection, treatment, follow up and most importantly prevention plays the key role. For diagnosing respiratory diseases Pulmonary function tests along with clinical presentations should be of utmost priority, as performing bed side pulmonary function tests can clarify the picture of ongoing disease which will help in planning of the ongoing treatment<sup>4,5</sup>

Chronic Obstructive Pulmonary Disease (COPD) by delineation is an irreparable inflammation of the lung airways causing to loss of elasticity of the alveoli and instigating air trapping with its augmented obligation, owing to never-ending risk of respiratory sicknesses and alterations in life style.<sup>6</sup>

Hence to detect the disease and make its earliest treatment is the final goal of a physician, for detection of the disease in this era of modern technology Spirometry is the gold standard. Thus a study was designed to see effects on lungs caused by COPD, asthma and Tuberculosis coming to our institution which may lay a stepping stone towards management of these deadlier diseases in future.

## Material and Methods:

In this institution based cross sectional observation study 60 individuals were registered. They were classified into three clutches. The study groups comprises of 20 patients having from Asthma, 20 patients with COPD and 20 patients with non-active tuberculosis appearing to the department of pulmonary medicine at hospital. Cardiovascular disease, hypertension and other major or active illness were excluded from existing study.

On the day of visit detailed clinical history of the patient was taken followed by rapid antigen test for COVID to rule out any possibility spread. After a negative rapid antigen report patient was taken for radiological investigations consisting of X-ray chest PA view for observing progress of the disease. And finally after demonstrating the patient spirometry was performed to record various parameters like FEV1, FVC, FEV1/FVC. Standard ATS/ERS course of action were trailed while performing the Spirometry procedure.<sup>7</sup>

Procedure for estimation of pulmonary function tests by spirometer:

The subject was requested to sit comfortable and relax. Place a sterile mouth piece in the patient's mouth in such way that the mouth piece rests fixed between the teeth and lips. Connect the mouth piece to spirometer. Close the nostrils with the help of nose clip. Tidal volume- subject was made to breath in and out normally through the mouth to measure tidal volume. FEV1- subjects was made to take maximum inspiration and asked to exhale as rapidly and as forcefully. The amount of air exhale may be measured at 1 second (FEV1), 2 seconds (FEV2), and 3 seconds (FEV3).

Forced vital capacity (FVC) subject was made to inhale as deep as possible and exhale forcefully, thus the forced vital capacity is measured.

Collected data were tabulated in Microsoft excel 13 and analyzed for Mean and standard deviation of each of the measured parameters in the study group were compared .For statistically significant results Analysis of variance (ANOVA) with Bonferronis post hoc test was applied using Graph pad prism 9 software.

### Results:

For present study along with clinical history and radiological investigations primarily demographic data in terms of age, height, weight and BMI were taken amongst the participants and analyzed as depicted in table 1:

**Table 1:**

Parameter	Asthma (20) (Mean $\pm$ SD)	Tuberculosis (20) (Mean $\pm$ SD)	COPD (20) (Mean $\pm$ SD)
Age (Years)	27.65 $\pm$ 17.61	37.2 $\pm$ 16.73	42.3 $\pm$ 14.07
Height (Cms)	156.3 $\pm$ 7	160.75 $\pm$ 10.31	159.85 $\pm$ 5.8
Weight (Kgs)	54.4 $\pm$ 14.88	63.4 $\pm$ 13.93	56.6 $\pm$ 9.66
BMI	22.03 $\pm$ 4.94	24.43 $\pm$ 4.54	22.16 $\pm$ 3.59

When compared by applying ANOVA test no statistical significance was found amongst all three groups ( $p > 0.05$ ) and hence the groups are comparable for study parameters The significance of difference in the levels of pulmonary function tests between the study group and control group. P value  $< 0.05$  will be considered statistically significant

**Table 2: Mean and SD of spirometry values in patients:**

Parameter	Asthma (20) (Mean $\pm$ SD)	Tuberculosis (20) (Mean $\pm$ SD)	COPD (20) (Mean $\pm$ SD)
FVC	2.20 $\pm$ 0.66	2.37 $\pm$ 0.78	1.5 $\pm$ 0.58
FEV 1	1.92 $\pm$ 0.55	1.92 $\pm$ 0.64	1.09 $\pm$ 0.45
FEV1/FVC	88. $\pm$ 4.52	81.11 $\pm$ 4.64	64 $\pm$ 6.79

The mean  $\pm$  SD levels of FVC in asthma is (2.2 $\pm$  0.66),TB (2.37  $\pm$  0.78) and (1.5 $\pm$  0.58) in COPD patients. The levels of FEV1 in respiratory diseases like Asthma, TB are ( 1.92 $\pm$  0.55), (1.92 $\pm$  0.64) and (1.09  $\pm$  0.45) in COPD patients. The ratio between the FEV1/FVC in Asthma, TB and COPD are ( 88.0 $\pm$  4.52, 81.11  $\pm$  4.64, 64 $\pm$ 6.79) respectively. In Asthma and TB the FVC and FEV1 values are indifferent with no statistically significant of ( $p > 0.05$ ).While comparison betweenCOPD- asthma and COPD-TB patents the FEV1 and FVC levels were changed with statistically significant of ( $p < 0.05$ )as depicted in post hoc results in table 2.

Table 2: Bonferroni's post hoc test results

N-  $p > 0.05$  not significant

+ -  $p < 0.05$  Significant

++ -  $p < 0.005$  highly significant

In COPD FEV1/FVC ratio is decreased with highly statistical significant with ( $p < 0.001$ ) in comparison to other two groups of patients.

### Discussion

The key feature in treatment of disease like COPD and TB is early detection which can be done with help of PFT. Considering the fact that there are various factors affecting PFT of which important one are gender, age, race and height causes variation in PFT values. Hence in present study age-sex matched individuals were considered for the procedure for reducing the confounding amongst the different groups similar event was followed by Cosio BG.<sup>8</sup>

For uncovering changes in pulmonary functions; spirometry is generally use which is supposed to be the gold standard for detecting COPD and asthma as it is also elaborated by Global initiative against obstructive lung diseases (GOLD). Global initiative for chronic obstructive lung diseases (GOLD).<sup>9</sup>

Pulmonary function test (PFT) are used in clinics to assess the extent of the deterioration in lung functions, to decide on treatment and to predict the prognosis, of the patient as it is very easy to perform even at bed side of the patient.<sup>10</sup> Spirometry also can be used to evaluate the response to treatment and in evaluating lung function in the preoperative period and in health research.

In present study significant results were observed in FEV1 and FVC in asthmatics, COPD and COPD- TB patient's comparison individuals similar results in different grades of COPD were observed to be non-significant by Gupta YS. These changes could be endorsed to the fact that asthma exacerbating factors will show their action on alveoli for till the exacerbation persists and later on due to use of bronchodilator drugs alveolar system sets to normal locus. Hence changes can be picked up by spirometry once the permanent irreversible damage sets in as in case of COPD.<sup>11</sup>

Considering FEV1/FVC ratio significantly reduced values were observed in asthma and COPD patients making this factor to be the specific in diagnosing the disease. Furthermore this parameter could be used to evaluate outcome of the treatment in these severely debilitated patients similar outcomes were enlightened by Enright PL and Gupta Y. further they have also stated the need of other diagnostic tools like body plethysmography for more sensitive and specific diagnosis of COPD.<sup>12,13</sup>

Considering the correlation between TB and spirometry it goes hand in hand as further progression of the disease in post tubercular period leads to obstructive pattern changes even in inactive or asymptomatic TB patients similar changes were observed by Patil S. This could be considered alarming as most often times these patients goes unnoticed once they complete their treatment regime hence regular follow up is absolute.<sup>14</sup>

As studied by Robles GI and Tepper R smoking is found to be the prime causative factor for COPD. Cessation of smoking is thought to be most significant factor for thwarting advancement of the disease if it is likely to perceive these changes at an earlier stage of the disease then mortality and morbidity can be reduced to a greater extent. More emphasis on studies need to be given to confirm whether this has a role in halting further progression

into COPD and potentially which could have a momentous profit in falling morbidity and mortality due to COPD.<sup>15, 16, 17</sup>

### Conclusion

At the end of the study it can be concluded that Spirometry of the patients with diseases like TB, asthma and COPD can lay a stepping stone in diagnosis and treatment outcomes of the patients if performed well within time which can benefit the society by reducing the disease burden. Furthermore studies are required to implicate these results to a larger population to make a COPD free India.

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