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## ORIGINAL ARTICLE

### A Hospital Based Prospective Study to Correlate the Six Minute Walk Test, Clinical and Radiological Parameters in COPD Patients

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#### ABSTRACT:

**Background:** COPD usually is diagnosed late in its natural course because patients may adapt to the condition or doctors may not notice the symptoms. Spirometry is however only one way of interpreting COPD disease severity. Quantitative assessment of symptoms like dyspnoea, measurement of PEFr and exercise test like 6-minute walk test (6-MWT), which are cheaper modes of diagnosis, can be considered to substitute the spirometry at places where it is not available. Therefore, this study aims to find out correlation of Six Minutes' Walk Test with Spirometric and Clinical parameters in COPD patients.

**Materials & Methods:** A hospital based prospective study was carried out in COPD patients at Government (RVRS) Medical College & Attached groups of Mahatma Gandhi Hospital, Bhilwara, Rajasthan. A total of 50 patients were included in the study, reporting to the OPD or admitted in the wards. At the time of test, the patient's heart rate, blood pressure and oxygen saturation were measured. The 6MWT was performed according to the ATS guidelines. The SPSS 16.0 software package was used for statistical analyses, and a value of  $p < 0.05$  was considered significant.

**Results:** Our study showed that the mean value of six-minute walk distance (6MWD) was  $373.5 \pm 67.82$  in stage I COPD,  $266.7 \pm 50.88$  in stage II,  $199.3 \pm 63.12$  in stage III &  $152.2 \pm 50.5$  in stage IV, which was statistical significant ( $P < 0.0001$ ). It means inverse relationship in six-minute walk distance (6MWD) and severity of COPD. The mean 6MWD was  $237.9 \pm 86.92$  meters (range 88-500 m) and correlated positively to weight, BMI and negatively correlated to breathlessness (mMRC grade) ( $P < 0.0001$ ).

**Conclusion:** Our results suggested that 6MWT can be used as an additional tool in combination with other physiological parameters in assessing the lung function in COPD patients. In conclusion, in COPD patients 6MWT is useful test to assess the severity of disease.

**Keywords:** COPD, 6MWT, GOLD Stage, Spirometry.

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#### INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major public health problem as it is one of the main causes of morbidity and mortality worldwide. The prevalence and burden of COPD are projected to increase in the coming decade due to continuous exposure to COPD risk factors and the changing age structure of the world's population.<sup>1</sup> COPD causes 2.7 lac deaths every year in India, hitherto it is under diagnosed. It is now recognized in 4-10 per cent of adult male population of India and several other Asian countries.

The global burden of disease study estimates that COPD results in 1.68 years of living with disability (YLD) per one thousand population, representing 1.8 percent of all YLDs, with a greater burden in men than women (1.93% v/s 1.42%).<sup>2,3</sup>

COPD usually is diagnosed late in its natural course because patients may adapt to the condition or doctors may not notice the symptoms. By then lung function is often poor sometimes <50% of normal. Patients may also not see the doctor until the disease is advanced.<sup>4</sup>

There are several possible ways to estimate the prevalence and, consequently, the burden of COPD. Health-care resource use attributed to COPD diagnoses, ie, outpatient visits or hospital

discharges may provide some estimate of the prevalence of COPD. An estimate based on resource utilization will underestimate true prevalence, however, as only those patients seeking medical attention or recognized by the clinician are captured. Most commonly, patients seeking medical attention have acute exacerbations and, in most cases, present with later stage disease. According to GOLD international COPD guidelines<sup>5</sup>, spirometry is the gold standard for accurate and repeatable measurement of lung function. Spirometry is however only one way of interpreting COPD disease severity. Other measures, such as the MMRC dyspnoea scale for measuring breathlessness, exacerbation frequency, body mass index, quality of life assessment, and exercise capacity all help to build a more complete picture. Quantitative assessment of symptoms like dyspnoea, measurement of PEFr and exercise test like 6-minute walk test (6-MWT), which are cheaper modes of diagnosis, can be considered to substitute the spirometry at places where it is not available. Recently, guidelines developed under the WHO-Govt. of India committee group also suggest that if spirometry is not available then both staging of the disease and follow up of patient can be done on the basis of severity of symptoms, PEFr and 6 MWT.<sup>6</sup> Therefore this study aims to find out correlation of Six Minutes' Walk Test with Spirometric and Clinical parameters in COPD patients.

#### **MATERIALS & METHODS:**

A hospital based prospective study was carried out in COPD patients at Government (RVRS) Medical College & Attached groups of Mahatma Gandhi Hospital, Bhilwara, Rajasthan. A total of 50 patients were included in the study, reporting to the OPD or admitted in the wards.

##### **Inclusion Criteria:**

- All the persons with age  $\geq$  30 years

##### **Exclusion Criteria:**

- Subjects unable to perform spirometry examination
- Major surgery in previous three months
- Recent Myocardial infarction, other cardiac diseases and history suggestive of diabetes and hypertension
- Chest deformity like scoliosis and Kyphosis
- Pregnant Women and lactation.
- Reversibility more than 12%
- History of alcoholism and addiction to Opium

##### **Study Procedure:**

The Subjects was undergo following-

- Detailed history and physical examination of an individual so that patients were examined clinically and radiologically to establish diagnosis of COPD based on GOLD guidelines

##### **Spirometry:**

- Patients with definite respiratory diagnosis underwent a spirometry, using standard protocol. Spirometric indices including FEV<sub>1</sub>, FVC, FEV<sub>1</sub>/FVC, FEF<sub>25-75%</sub> and PEFr were tested using computerized spirometer. Reproducibility was ensured by doing at least three measurements for each lung function.
- All measurements were performed 15 minutes after inhalation of (200-400 $\mu$ g of salbutamol via a metered

dose inhaler. Patients with FEV<sub>1</sub>/FVC < 0.7 after bronchodilation will defined as possible COPD patients.

- All manoeuvres fulfilled the acceptability (extrapolated volume < 5% of FVC or 0.15L whichever was greater, duration of > 6 s or a plateau in the volume-time curve) and reproducibility criteria (were within 0.150L). Calibration was performed on the same day.
- Patients with COPD were categorised according to Global initiative for Obstructive Lung Disease (GOLD) stages (FEV<sub>1</sub> % predicted after bronchodilation > 80% for stage I, 50-80% for stage II, 30-50% for stage III and < 30% for stage IV).
- Before commencement of the test whole procedure was made to understand the subjects and they were explained in detail that what to do during procedure by giving demonstrations.

##### **Six minute walk test**

At the time of test, the patient's heart rate, blood pressure and oxygen saturation were measured. The 6MWT was performed according to the ATS guidelines.<sup>7</sup> Subjects were asked to walk at their own pace, along a 30 m long and straight hospital hallway marked at intervals of one meter each. Each patient was instructed to walk as much distance as possible in 6 minutes. No encouragement was offered, but the patient was told standardized phrase to indicate the time remaining. The patient was allowed to stop if symptoms of significant distress occurred, like severe dyspnea, chest pain, dizziness, diaphoresis, or leg cramps. However, the patient was asked to resume walking as soon as possible, if he or she could. At the end of six minutes, the patient was asked to stop and a repeated measurement of blood pressure, heart rate, oxygen saturation by pulse oximeter, were measured and the distance walked for 6 minutes was recorded. The patients were asked to be observed for a 10-15 minutes period after the test, to assess any possible complications. Patients who started to walk but did not complete the test, were included in the study.

##### **Pulmonary Function Test**

Patients with definite respiratory diagnosis underwent a pulmonary function test, using standard protocol. Spirometric indices including FEV<sub>1</sub>, FVC, FEV<sub>1</sub>/FVC and peak expiratory flow rate, FEF<sub>25-75%</sub> were tested using computerized spirometer (nidd Medizintechnik AG). Reproducibility was ensured by doing at least three measurements for each lung function.

##### **Statistical Analysis**

Data are presented as means  $\pm$  SD. The SPSS 16.0 software package was used for statistical analyses, and a value of  $p < 0.05$  was considered significant.

#### **RESULTS**

Our study showed that the mean value of six minute walk distance (6MWD) was 373.5 $\pm$ 67.82 in stage I COPD, 266.7 $\pm$ 50.88 in stage II, 199.3 $\pm$ 63.12 in stage III & 152.2 $\pm$ 50.5 in stage IV, which was statistical significant ( $P < 0.0001$ ). It means inverse relationship in six minute walk distance (6MWD) and severity of COPD (table 1).

The mean 6MWD was 237.9  $\pm$  86.92 meters (range 88-500 m) and correlated positively to weight, BMI and negatively correlated to breathlessness (mMRC grade) ( $P < 0.0001$ ) (table 2).

**Table 1: Comparison between six minute walk distance (6MWD) and the severity of COPD**

GOLD stage	FEV1% predicted	No. Of cases	Mean±SD (6MWD)
Stage I	>80%	4	373.5±67.82
Stage II	50-80%	22	266.7±50.88
Stage III	30-50%	19	199.3±63.12
Stage IV	<30%	5	152.2±50.5

F ratio= 27.24, P-value&lt;0.0001

**Table 2: Correlation between 6MWD and Patient's parameters**

Parameters	Range	Mean±SD	R (correlation coefficient)	P-value
Age (yrs)	(34-87)	55.83±10.66	-0.03692	>0.05
Height (meters)	(1.36-1.73)	1.57±0.082	-0.06491	>0.05
Weight (kg)	(30-78)	54.35±9.932	0.03752	>0.05
BMI (Kg/m <sup>2</sup> )	(13.66-34.73)	21.77±3.769	0.09273	>0.05
Breathlessness (mMRC grade)	(0.0-4.0)	1.530±1.088	-0.7441	<0.0001

## DISCUSSION

The chronic airflow limitation characteristic of COPD is caused by a mixture of small airway diseases (obstructive bronchiolitis) and parenchyma destruction (emphysema), the relative contributions of which vary from person to person. Chronic inflammation causes structural changes and narrowing of the small airways.

In present study the male to female ratio was 4:1. This higher incidence of COPD in males can be attributed to smoking. In our study none of the females were smokers but all of them had history of cooking with dried cow dung or dried wood fuel. Manoj Kumar Khandelwal et al<sup>8</sup> founded male to female ratio was 3:1.

Maximum patients were in 45 to 64 years of age group, mainly because of the longer duration of tobacco exposure which would have compromised their quality of life. Tamakuwala Grinish et al<sup>9</sup> reported the mean age was 55.39(±11) years, range 37-86 years.

Exercise intolerance in COPD patients is an important development in the natural history of COPD and has important implications on health-related quality of life, hospitalization rate and survival. The 6-Min Walk Test (6MWT) is a simple tool for

the evaluation of functional exercise capacity, which reflects the capacity of the individual to perform activities of daily living. Since the 6MWT is a self-paced test, the results are influenced by external factors such as energy expenditure, operator encouragement and subject motivation. The inconsistencies resulting due to gait speed (height), body weight and gender are sources of error to calculate exercise tolerance by 6MWD alone.

Casanova C et al<sup>10</sup> concluded that the 6-min walking distance test provides increasingly useful information as the severity of chronic obstructive pulmonary disease increases.

Manoj Kumar Khandelwal et al<sup>8</sup> found different GOLD stages were found to have positive correlation to 6MWD (P<0.05).

Tamakuwala Grinish et al<sup>9</sup> reported that patient with mild COPD (Grade I) has mean 6MWD of 379.11m; moderate COPD (Grade II) has mean 6MWD of 261.85m; severe COPD (Grade III) has mean 6MWD of 189.27m. All above findings are statistically significant (p Value <0.05), which was similar with our results.

The mean 6MWD was 237.9 ± 86.92 meters (range 88-500 m) and correlated positively to weight, BMI and negatively correlated to breathlessness (mMRC grade) (P<0.0001) in our study. Similar results found by Mitali Bharat Agrawal<sup>11</sup>, Tamakuwala Grinish et al<sup>9</sup> and Ruchita B. Hajare et al<sup>12</sup>.

## CONCLUSION

Our results suggested that 6MWT can be used as an additional tool in combination with other physiological parameters in assessing the lung function in COPD patients. In conclusion, in COPD patients 6MWT is useful test to assess the severity of disease.

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