

Original Article

ASSOCIATION OF SIX MINUTE WALK TEST WITH SPIROMETRY PARAMETERS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASES

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ABSTRACT

Introduction: A significant health issue on a global scale is chronic obstructive pulmonary disease (COPD). The gold standard for determining a COPD diagnosis and severity is spirometry. The patient's functional ability is evaluated using the 6MWT, a basic, reliable test. It aids in prognostic prediction and management. The purpose of this study was to determine whether the results of the 6MWT correlated with the patient's clinical and spirometric characteristics. The study also examined whether the six-minute walk distance (6MWD) may serve as a substitute for spirometry in determining the severity of COPD in settings with scarce resources.

Materials and methods: This cross-sectional study was conducted in a hospital. Following the application of inclusion and exclusion criteria, 70 consecutive patients with proven COPD (according to GOLD recommendations) were included in the study. Pre- and post-bronchodilator spirometry tests were used to gauge severity. According to ATS recommendations, 6MWT was then performed and noted. The 6MWT results were associated with the patients' spirometric and clinical data.

Results: It was found that, there was a statistically positive and highly significant ($p < 0.01$) correlation between 6minute walk test values and % predicted FEV₁, FVC and FEV₁/FVC ratio of spirometry in COPD study participants.

Conclusions: This study found a significant positive association between patients' spirometry parameters (%FEV₁, FVC, FEV₁/FVC) and 6MWD. Thus, 6MWT can be used to determine the severity of COPD.

Keywords: Chronic Obstructive Pulmonary Disease, 6-minute walk test, Spirometry

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Date of Receiving: 12 Apr 2023
Date of Acceptance: 18 May 2023
ISSN: 0970-1842



INTRODUCTION

A significant health issue on a global scale is chronic obstructive pulmonary disease (COPD) [1]. It is a prevalent, preventable, and curable condition marked by enduring respiratory symptoms and airflow obstruction, which are brought on by abnormalities of the airways and/or alveoli, which are typically brought on by continuous exposure to noxious particles or gases. As a patient gets older, their COPD impairment worsens and their lung function declines.

The gold standard for evaluating COPD is spirometry. This test also determines the disease's severity, which aids in management. The six-minute walk test (6MWT) is a clinical marker of functional capacity in individuals with cardiovascular illnesses [2]. It is a moderate intensity exercise test. It is a method that measures someone's ability to carry out activities of daily living realistically. The six minute walk test is used in patients with chronic respiratory diseases such chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), pulmonary hypertension (PH), and chronic heart failure to assess exercise performance, track medication, and predict prognosis [3].

It has been tested in many populations for its safety, validity, repeatability, and correlations with a number of physiological markers. An easy test to evaluate a patient's functional

capacity is the 6 minute walk test (6MWT) (ability for day to day activities). It costs little to perform the test, and it is consistent. In order to effectively manage COPD, it's crucial to improve the patient's symptoms. According to how severely the airways are obstructed, the management is determined (GOLD stages) [4]. The patient's ability to exercise may or may not be accurately depicted by the patient's spirometric data (FEV1).

It is crucial to understand whether the GOLD severity stages coincide with the patient's functional ability. It is important to know whether the results of the 6MWT correlate with the flow and volume indices of spirometry in this situation. Additionally, a strong connection between Studies have linked different spirometry parameters in COPD with arterial blood gases (ABG), such as oxygen and carbon dioxide. Spirometry is frequently unavailable in rural locations, 6MWT is feasible in certain circumstances [1,5].

The goal of the current investigation was to determine whether the 6MWT might supersede spirometry as a predictor of the severity of COPD by correlating spirometric data with its results. This study aimed to determine if the 6MWT correlated with the patient's spirometric characteristics and whether the six-minute walk distance (6MWD) may serve as a substitute for spirometry in determining the severity of COPD in settings with scarce resources.

The objectives of the study were:\

- 1) To ascertain the severity of COPD patients based on their spirometry and six minute walk test
- 2) To find out the correlation between six minute walk test with spirometry parameters

MATERIALS AND METHODS

This cross-sectional study was carried out in the Department of Respiratory medicine, Subharti Medical College from June 2022 to August 2022. The institution's ethics committee granted the project approval. In order to confirm instances of COPD (based on GOLD criteria) arriving at the Respiratory medicine out-patient department, the informed consent was obtained from each patient before commencement of the study. the following inclusion and exclusion criteria were used to decide which patients will participate in the study.

INCLUSION CRITERIA:

- All confirmed cases of COPD
- Age >40 years and less than 75years

EXCLUSION CRITERIA:

- HR >120/mt
- BP > 180/100
- any systemic condition other than COPD

Convenience sampling technique was used and 70 study subjects were taken. Demographic information about the patients (such as age and sex) was recorded.

SPIROMETRY:

According to American Thoracic Society recommendations, it was carried out by a skilled technician. For analysis, the best outcome from three attempts was chosen. 15 minutes after giving a short acting bronchodilator, spirometry was performed once more. The following spirometric measurements were made: FEV1/FVC ratio, FEV1,%FEV1, FVC.

In accordance with GOLD recommendations, patients who had obstructive ventilatory defects were divided into three categories: mild, moderate, severe, and extremely severe.

6MWT:

Following spirometry, 6MWT was performed on a 30-meter stretch (per the ATS recommendation)as follows:

- The patient rested for 10 minutes before the test.

Heart rate (HR), blood pressure (BP), SpO₂, and the presence of dyspnea were monitored at baseline. At the conclusion of the test, same parameters were again recorded. meterage was covered in 6 minutes of walking.

- Chest pain, severe dyspnea, lower extremity muscle spasms, or the patient's desire to stop the test all resulted in its termination.

- The patients' post-test was monitored for 15 minutes for any negative effects.

Statistical Analysis:

The data was gathered and analyzed using SPSS version 26. Statistical analysis was carried out using Descriptive statistics and other relevant tests of significance. Pearson's correlation was performed to understand the correlation between the different variables assessed in the study. The value of the correlation coefficient ranges between -1 to +1. Minus one implies that there is inverse relation between the two variables, i.e. an increase in one will cause a decrease in the other variable. Zero value of correlation coefficient implies that there is no relation between the two variables. The p value was set at 0.05 to be significant, and p value less than 0.01 was considered as highly significant. Confidence level was set at 95% and power of the study was fixed at 80%.

RESULTS

Total number of study participants were 70, Three of them were lost to follow up. The overall mean age group was found to be 61.20 in this study. Among the total 67 study participants, 59 (86.8%) were males and 8 (11.8%) were females in this study (Tables 1 & 2).

Table 3 shows that when the 6 minute walk test of the study participants are compared based on them being grouped as per their Gold stage, a highly significant ($p < 0.01$) difference is seen in the walk test values. The mean value column shows that the

highest value for walk test was seen in the participant in GOLD stage I and the lowest value of walk test was seen in the participant in GOLD stage IV.

Table 4 shows the correlation between the values of the walk test of the participants and the other variables. It was seen that there was a positive, medium and highly significant ($p < 0.01$) correlation between the post FVC and 6minute walk test values of the study participants. It meant an increase in the value of walk test also shows a significant increase in the value of Post FVC, moderately. It was found that there was a negative, very weak and non-significant ($p < 0.05$) correlation between the post FEV1 and walk test values of the study participants. Meaning that an increase in the value of walk test shows a weak decrease in the value of Post FEV1.

It was observed that there was a positive, medium and highly significant ($p < 0.01$) correlation between the FEV1/FVC and walk test values of the study participants. When there was an increase in the value of walk test also shows a significant increase in the value of FEV1/FVC, moderately. It was seen that there a positive, weak and highly significant ($p < 0.05$) correlation between the % predicted FEV1 and walk test values of the study participants. That meant an increase in the value of walk test also shows a weak, but significant increase in the value of % predicted FEV1.

Variable	Number	Minimum	Maximum	Mean	Std. Deviation
Age	67	41.00	80.00	61.2090	7.98775

Table 1. Age of the study participants.

Variable		Frequency	Percent
Gender	Male	59	86.8
	Female	8	11.8
	Total	67	98.5

Table 2. Gender wise distribution of the study participants.

GOLD Stage	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	P value
				Lower Bound	Upper Bound			
I	1	453.00	.	.	.	453.00	453.00	0.00*
II	23	369.60	38.667	352.88	386.32	318.00	468.00	
III	32	342.71	31.886	331.22	354.21	303.00	418.00	
IV	12	247.00	37.872	222.93	271.06	180.00	320.00	

Table 3. Intergroup comparison the values of walk test of participants based on GOLD stage.

Pearson's Correlation		Walk Test	Post FVC	Post FEV1	FEV1/FVC	Percentage predicted FEV1
Walk test	Pearson Correlation	1	.549**	-.087	.459**	.230
	P Value		.000**	.481 (NS)	.000**	.05*
	N	68	68	68	68	68

Table 4. Pearson's Correlation between different variables assessed in the study.

DISCUSSION

Severity of a diseases should be diagnosed in order to effectively treat and manage COPD patients. Mostly now a days severity is assessed by post-bronchodilator FEV1 (%predicted) based on GOLD guidelines. 6MWT can be used as a crucial evaluating tool in catagorizing severity of COPD where spirometry is not possible or unavailable. The present study found significant correlation of 6MWD with spirometric and clinical indices like % predicted FEV1, FVC, FEV1/FVC ratio.

Correlation with 6MWD:

% FEV1: In the current investigation, there was a statistically significant connection between % predicted FEV1 and 6MWD (p=0.00**). Similar correlations between FEV1 and 6MWD have also been

discovered in a number of earlier investigations [5-7]. But a research by Chauhan et al. discovered a contrary outcome [8].

FVC: The current study found a highly significant (p.001) positive connection between FVC and 6MWD. Similar findings of the connection between 6MWD and FVC were also found by other studies [6,7,9,10]. Three researches revealed an association with FVC in additional [6,7]. No such association was established in one study by Kodawala et al. [11].

FEV1/FVC: The FEV1/FVC ratio and 6MWD significantly correlated in this study (p .01). Similar outcomes have been discovered in a few investigations [7]. However, there was no correlation between 6MWD and the

FEV1/FVC ratio according to Kundu et al. and Nagshin et al. [7,12].

CONCLUSION

As per the results obtained after statistical analysis of this study, there exists a significant positive association between patients' spirometry parameters (%FEV1, FVC, FEV/FVC) and 6MWD. Thus, 6MWT can be used as an effective measure to determine the severity of COPD.

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