

## CORRELATION BETWEEN 6 MINUTE WALK TEST AND DIFFUSION CAPACITY OF LUNG FOR CARBON MONOXIDE (DLCO) IN DIFFUSE PARENCHYMAL LUNG DISEASES (DPLD)

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### ABSTRACT

**AIM:** To find a relationship between the results of 6-minute walk test and DLCO in patients with radiologically confirmed DPLD

**MATERIALS & METHODS:** A prospective observational study was conducted from October 2020 – October 2022 who presented to the department of Respiratory Medicine. A total of 41 patients who presented with chronic dyspnoea and who were clinically and radiologically suggestive of DPLD were included in the study. All of them underwent the 6-minute walk test and DLCO which were later compared.

**RESULTS:** There was significant correlation between 6MWD and DLCO but there was no correlation between desaturation and DLCO statistically but found clinically significant desaturation among 37 patients out of 41 patients who underwent 6MWT. We also compared age, sex, history of smoking, patients who had taken treatment and patients who had not received any treatments, could not find any correlations statistically in 6MWD, desaturation and DLCO.

**CONCLUSION:** DLCO can be done only in specialised centres whereas 6MWT is an economic test, easily accessible to physicians for assessing the functional capacity of the lungs in DPLD patients where DLCO is not available.

**KEYWORDS:** 6-Minute Walk Test, Diffusion capacity of Lungs for Carbon Monoxide, Diffuse Parenchymal Lung Disease

### INTRODUCTION:

Diffuse Parenchymal Lung Disease (DPLD) is a group of disorder that share common clinical, radiographic, and physiological features. Majority of the DPLD patients has dyspnoea on exertion, with dyspnoea as their first symptom. It has been noticed that significant desaturation following exertion in DPLD patients [1].

For patients with chronic lung disease, 6-minute walk test (6MWT) is the most commonly used exercise capacity assessment. Exercise tolerance assessed with 6MWT is sub maximal capacity as most patients cannot achieve maximal effort while performing the test [2]. It reassesses the functioning of the pulmonary, cardiovascular, and neuromuscular systems. Therefore, a cardiopulmonary exercise test can reveal particular information on which system causes activity limitation, which is thought to be difficult to supply. [3, 4]. When exercising, patients with DPLD frequently suffer dyspnoea, which may limit their ability to engage in certain activities or exercises. Exercise testing can therefore be very helpful for clinically evaluating people with DPLD. The correlation of a 6-minute walk distance, however, has been investigated in a number of disorders.

When performing the 6MWT, measurements of oxygen saturation and dyspnea are typically taken in addition to the distance walked, both walking distance and desaturation are strong predictive markers in the six-minute walk test in DPLD diseases like idiopathic pulmonary fibrosis (IPF) [5]. Thus, evaluating outcome of 6MWT is important in cases of DPLD.

Carbon monoxide (CO) binding is 230 times stronger than oxygen with haemoglobin which is less in amount in blood and can also function to measure diffusing capacity of the lungs. The carbon monoxide transfer factor (DLCO, also known as TLCO), which is determined in this test, is one of the PFT's most challenging to perform for an individual. The alveolar-capillary membrane's structural integrity is symbolized by the alveolar-capillary membrane's ability to transport carbon monoxide from the alveolar gas to haemoglobin, according to the transfer

factor. The single breath method is commonly used method to measure the DLCO. Primarily in research, the vascular disease, and evaluation of pulmonary disability/impairment all benefit from diffusing capacity measurement. [7]

The lung's surface area, alveolar-capillary membrane thickness, the solubility and molecular weight of the gas, are the factors affecting the rate of transfer of gases. Despite having a similar molecular weight to oxygen, CO<sub>2</sub> diffuses roughly 20 times more quickly due to its high solubility. [8]. In our investigation, we are contrasting 6MWT with DLCO in individuals with DPLD.

## MATERIALS AND METHODS:

- **Study Design:** Prospective observational study.
- **Place of study:** Department of Respiratory Medicine, Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune-411018
- **Period of study:** October 2020 to October 2022.
- Institute Ethics Committee clearance was obtained before the start of study.
- **Sample Size:** 41 patients  
Assuming the mean 0.50 +/- 0.22 from the study 'Correlation of DLCO versus DLCO/VA with functional parameters in interstitial lung disease' Manasy et al, Belgundi Preeti et al, Nithya et al, Asmita et al with acceptable difference of 0.07 and assumed SD 0.22. Software used was WINPEPI and calculated minimum sample size is 41.
- A total of 41 patients who presented with chronic dyspnoea and who were clinically and radiologically suggestive of DPLD were included in the study. All of them underwent the 6-minute walk test and DLCO which were later compared.
- **Inclusion Criteria:**
  - ❖ Patients who could perform six-minute walk test
  - ❖ Patients who could perform pulmonary function tests including DLCO
  - ❖ Patients who showed restrictive pattern in pulmonary function test
  - ❖ Patients with HRCT chest confirmatory for DPLD
  - ❖ Patients previously diagnosed and are on treatment for DPLD
  - ❖ Patients not on oxygen therapy
- **Exclusion Criteria:**
  - Patients who cannot perform six-minute walk test
  - Patients with obstructive pattern on pulmonary function tests
  - Patients with diagnosis of COPD, pulmonary arterial hypertension and chronic heart failure
  - Patients who are on LTOT

## METHODOLOGY

- ◆ The subjects for the study will be selected from the patients who were admitted in (DPLD) in-patient department of Respiratory Medicine, Dr. D.Y. Patil medical college hospital and research centre, Pimpri, Pune after fulfilling the inclusion and exclusion criteria and after obtaining informed written consent.
- ◆ Patient's detailed history was taken. Thorough clinical examination was done. Age, sex, height, weight and BMI of the patients were recorded.
- ◆ **Materials Required:**
  - Chest X-ray
  - HRCT chest
  - Six-minute walk test
  - DLCO
  - ECG
  - 2D-ECHO

**❑ Six-minute walk test:**

Patient’s vitals like heart rate, blood pressure, respiratory rate were measured. Using pulse oximeter, saturation of oxygen was noted. According to ATS guidelines, 6MWT were performed on patients. Later patients were asked to walk at their own pace, along a 30 m long and straight hospital corridor and patients were asked to walk as much distance as possible in 6 minutes and were allowed to stop only if they develop severe dyspnoea, chest pain, dizziness, diaphoresis, or leg cramps. And the patients were asked to continue walking, if he or she could. Throughout the 6MWT pulse oximeter was kept on finger and the saturation was measured at the end of every 1 minute. At the end of six minutes, the patients were asked to stop and vital signs like blood pressure, heart rate, respiratory rate and oxygen saturation were assessed again.

**❑ DLCO:**

DLCO was performed using single breath technique, night and morning prior to performing the manoeuvre, avoidance of bronchodilators or nebulisations were instructed.

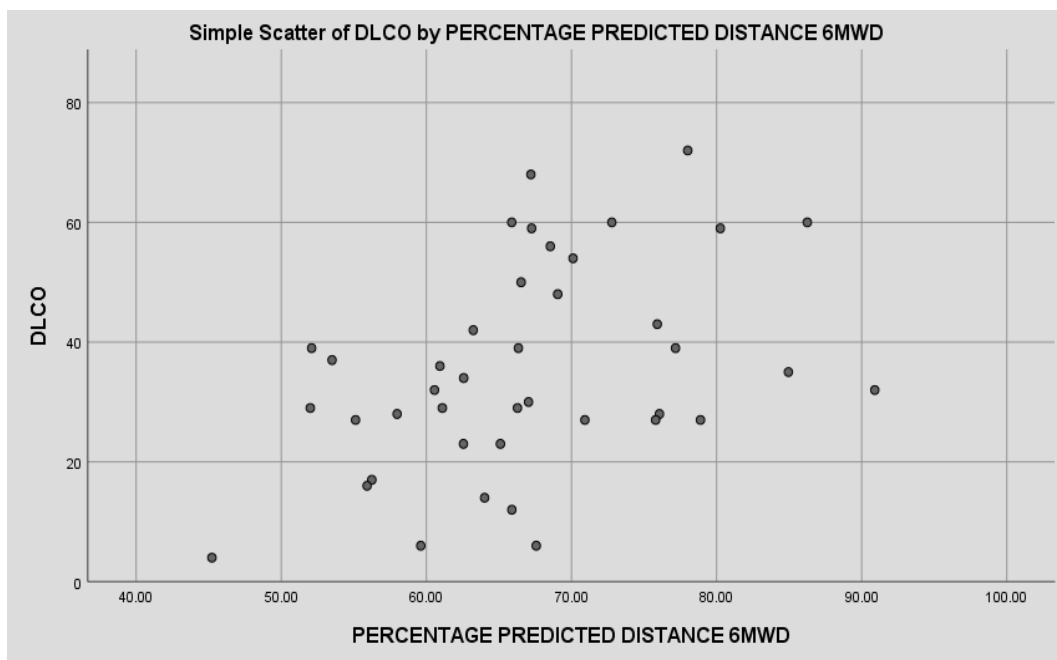
The percent predicted 6MWD was calculated from the actual 6MWD using Enright et al., formula

1. Predicted 6MWD (male) = (7.57 x height in cm) - (5.02 x age) - (1.76 x weight in kg) - 309m
2. Predicted 6MWD (female) = (2.11 x height in cm) - (2.29 x weight in kg) - (5.78 x age) + 667m
3. Percent predicted of 6MWD = actual 6MWD/ predicted 6MWD x100.

**OBSERVATIONS AND RESULTS:**

❖ *Correlation between 6MWT & DLCO*

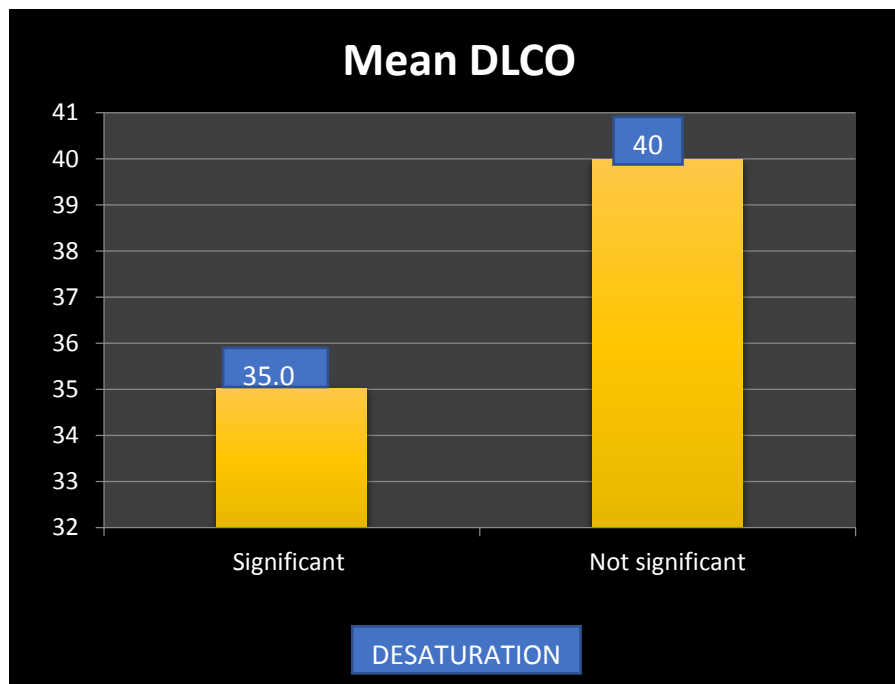
- PERCENTAGE PREDICTED DISTANCE 6MWD AND DLCO



**There was a significant positive correlation between Percentage distance walked in the predicted and DLCO**

- DESATURATION AND DLCO

Desaturation	Mean	SD	p value
Significant	35.03	16.81	0.706
Not significant	40	23.57	



**No significant association was found between DLCO and Desaturation.**

- There was no significant association found between DLCO, Percentage predicted distance among the treatment taken and not taken.
- No significant association was found between in 6MWT, DLCO and age groups or sex
- No significant association was found between 6MWT, DLCO and history of smoking.

## DISCUSSION

In a study done by **Shanmugapriya K., Anbumaran Parivakkam Mani , Prashanth Gururaj et al** , were their objective was to compare the age ,sex ,smoking in DPLD patients of 40 sample size using 6MWT and DLCO which shows no statistical significance in age,sex and smoking history among DPLD patients. [9]

In a study conducted by **Seema , Nalini Jayanthi Nagesh et al**, which was a cross sectional analytical study with population of 31 cases with an objective to compare between 6MWT and percentage predicted DLCO in connective tissue DPLD cases establishing a significant correlation between 6MWT including desaturation percentage and 6MWD with percentage DLCO with a p value less than 0.05.[10]

In a study conducted by **Merugu Sai Sashank, Manasa Vamsi Priya , et al** with an aim of finding relationship between 6MWT and DLCO in radiologically confirmed DPLD patients in a population of 32 patients where they underwent 6MWT and DLCO and showed significant desaturation in patients who undertaken 6MWT and significant correlation among 6-minute walk distance, percent predicted 6-MWD and DLCO. [8]

In our study with population of 41 cases who were radiologically diagnosed cases of DPLD who had satisfied our inclusion and exclusion criteria, results obtained were we could not find a significant correlation between desaturation and DLCO but significant correlation was established between percentage predicted 6MWD and DLCO. Also in our study we could find males had percentage predicted 6MWD when compared with females but no correlation was found between DLCO and sex. There were no significant association found between DLCO and difference in saturation in male and female sexes, also no significant association was found between DLCO, Percentage predicted distance and treatment taken groups. There were no significant association found between difference in saturation and age groups. There was no significant association was found between Percentage predicted distance, DLCO and age groups.

## CONCLUSIONS

In our study, we were able to find an association between 6MWD and DLCO though we could not find any correlation between desaturation and DLCO statistically but these patients had significant desaturation clinically so we are concluding that this disparity might be because of lower sample size.

6MWT is the economical, safest modality in assessing the functional capacity of the lungs. It can be performed by clinicians in OPD setups still it is underrated, as our study proves association between walking distance and DLCO and clinically significant desaturation despite of small study population, we can consider doing 6MWT as a primary modality in assessing the functional status of the lung, treatment prognosis and in follow up cases in centres where DLCO is not available, though the 6MWT mentioned is not a replacement for DLCO.

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