

CORRELATION OF PERCEIVED DYSPNEA WITH 6 MINUTE WALK TEST AND SPIROMETRIC FINDINGS IN DIFFUSE PARENCHYMAL LUNG DISEASE PATIENTS IN A TERTIARY CARE HOSPITAL.

Pulmonary Medicine

Dr. Rahul Chakraborty*

Senior Resident Dept of Respiratory Medicine, ID And BG Hospital Kolkata.
*Corresponding Author

Dr. Jaydip Deb

Professor And HOD, Dept. of Respiratory Medicine, N.R.S MCH, Kolkata

ABSTRACT

DYSPNEA12score is a reliable method of grading patient perceived dyspnea. The distance covered by 6min walk test is used to grade performance capacity. FVC percentage by spirometry is used to assess disease severity in DPLD patient. After taking detailed history and clinical examination 6minute walk test, spirometry, HRCT thorax carried out in all patients with DPLD. Dyspnea score calculated in all patients. Correlation of dyspnea 12 score is made with 6minute walk test findings, spirometric analysis. mild, 20% had moderate and 24% had severe on dyspnea 12 score.

Study conducted among 50 patients showed 56% patients had mild, 20% had moderate and 24% had severe on dyspnea 12 score. By 6MWT 28% patients had normal distance covered (>350m), 38% patients had mildly reduced distance (250-349m) covered, 12% patients had moderately reduced distance (150-249m) covered and 22% patients had severely reduced (<149m) distance covered. spirometry analysis showed 28% patients had mild restriction, 26% patients had moderate restriction, 8% patients had normal spirometry interpretation and 38% patients had severe restriction. Dyspnea 12 score has positive correlation with 6minute walking distance covered and FVC percentage (by spirometry). Dyspnea 12 score has positive correlation with 6minute walking distance covered and FVC percentage (by spirometry).

KEYWORDS

Diffuse parenchymal lung diseases, 6minute walk test, forced vital capacity, high resolution computed tomographic scan

INTRODUCTION

Diffuse Parenchymal Lung Disease [1] (DPLD, is a group of lung diseases affecting the interstitium (the tissue and space around the alveoli (air sacs of the lungs).

It concerns alveolar epithelium, pulmonary capillary endothelium, basement membrane, and perivascular and perilymphatic tissues. It may occur when an injury to the lungs triggers an abnormal healing response.

In our study patient perceived dyspnea is graded on the basis of dyspnea 12 score. In patients with DPLD, the D-12 score [2], a patient-reported measure of dyspnea severity, is a reliable and valid [3] instrument. It is short, simple to complete, and easy to score.

APPENDIX: DYSPNOEA-12 QUESTIONNAIRE

This questionnaire is designed to help us learn more about how your breathing is troubling you. Please read each item and then tick in the box that best matches your breathing these days. If you do not experience an item tick the "none" box. Please respond to all items.

Item	None	Mild	Moderate	Severe
1. My breath does not go in all the way				
2. My breathing requires more work				
3. I feel short of breath				
4. I have difficulty catching my breath				
5. I cannot get enough air				
6. My breathing is uncomfortable				
7. My breathing is exhausting				
8. My breathing makes me feel depressed				
9. My breathing makes me feel miserable				
10. My breathing is distressing				
11. My breathing makes me agitated				
12. My breathing is irritating				

(You do not recommend use of the instrument with data item more than three items missing. The method for scoring the Dyspnea-12 with up to three missing items is detailed in the table below.)

Number of items missing	Calculation to account for missing items	Dyspnea-12 score calculation
1	$35 \div 33 = 1.09$	1.1 x total Dyspnea-12 score
2	$35 \div 30 = 1.2$	1.2 x total Dyspnea-12 score
3	$35 \div 27 = 1.3$	1.3 x total Dyspnea-12 score

FIG 1: Dyspnea 12 score

The six minute walking test (6MWT) [4] was developed by the American Thoracic Society [4] and it was officially introduced in 2002, coming along with a comprehensive guideline.

The 6 Minute Walk Test is a sub-maximal exercise test used to assess aerobic capacity and endurance [5,6]. The distance covered over a time of 6 minutes is used as the outcome by which to compare changes in performance capacity [5,6].

Gradings of 6 minute walking distance :

>350 meter: normal
250-349m : mildly reduced
150-249m: moderately reduced
<149m : severely reduced

Setting	Clinical Practice
Initial test	Perform on room air if resting $SpO_2 > 88\%$
Repeat test	30-min rest between walks may not be feasible or necessary (rest until vitals return to baseline). Generous O_2 to prevent SpO_2 -limited walk. Separate oxygen titration test (if needed)
Instructions to patients	"Walk as far as you can in 6 minutes" Encouragement every 30 s using standardized phrases. Encouragement every 30 s during rest using standardized phrases (if applicable)
Required personnel and equipment	Technician to administer test; provide instructions and record data; >30 m flat, straight corridor with distance marked; chair for rest; stopwatch; blood pressure measurement device; continuous pulse oximeter for SpO_2 and HR; visual Borg scale; source of portable supplemental oxygen
Parameters to record	Resting HR, blood pressure, SpO_2 , Borg Nadir SpO_2 during test 6-minute HR, SpO_2 , Borg 1-minute recovery HR, SpO_2 HR recovery Total distance Time rest begins and ends (if applicable) O_2 delivery (L/min, pulsed or continuous, use of oxymizer device, method of oxygen tank transport)
Stop criteria (any of the listed reasons)	$SpO_2 < 80\%$ (for at least 6 s) Chest pain Intolerable dyspnea Leg cramps/fatigue Staggering Diaphoresis Pale or ashen appearance
Criterion to resume walk	$SpO_2 \geq 85\%$
Subsequent tests	Use supplemental O_2 provided during previous walk (unless significant clinical change renders it dangerous)

FIG2 : 6 Minute Walk Test

Spirometry [7] (meaning the measuring of breath) is the most common of the pulmonary function tests (PFTs) [9]. It measures lung function, specifically the amount (volume) and/or speed (flow) of air that can be inhaled and exhaled.

Spirometry [7,8] is helpful in assessing breathing patterns that identify conditions such as asthma, pulmonary fibrosis, cystic fibrosis, and COPD. Forced vital capacity (FVC) is the total amount of air exhaled during the FEV test. Forced expiratory volume and forced vital capacity are lung function tests that are measured during spirometry. FVC [10] is used to assess disease severity in DPLD patients [11].

classification of restrictive changes in spirometry IN DPLD patients
MILD : <LLN BUT >75%
MODERATE : 50-75%
SEVERE : 25-49%
VERY SEVERE : <25%

MATERIALS AND METHOD

Study Design:

The prospective study was conducted on the patients of DPLD, diagnosed by HRCT THORAX and clinical features, of more than 12 yrs age. The study was conducted in the dept. of respiratory medicine in a tertiary care hospital of Kolkata during the period of June 2018 to June 2019. Patients diagnosed as DPLD from OPD and IPD were included in the study, after excluding few patients remaining 50 patients were taken for the study.

Inclusion Criteria:

All patients diagnosed as DPLD based on clinical and radiological parameters.

Exclusion Criteria:

- 1) patients with poor general condition and hemodynamic instability and resting SpO₂ < 88% on room air
- 2) any other patients of dyspnea apart from diffuse parenchymal lung disease

Study Protocol

This study was done after getting approval from the Ethical Committee of the institution and it was conducted in the dept of respiratory medicine in a tertiary care hospital of Kolkata.1. At first meticulous history taken for all the patients.

Statistical Analysis:

For statistical analysis data were entered into a Microsoft excel spreadsheet and the analyzed by SPSS (version 24.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. One-way analysis of variance (one-way ANOVA) was a technique used to compare means of three or more samples for numerical data (using the F distribution). A chi-squared test (χ^2 test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. Explicit expressions that can be used to carry out various t-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a t-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test. Once a t value is determined, a p-value can be found using a table of values from Student's t-distribution. If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis. p-value ≤ 0.05 was considered for statistically significant.

RESULT:**Table 1: Distribution Of Dyspnea 12 Score**

DYSPNEA 12 SCORE	Frequency	Percent
Mild	28	56.0%
Moderate	10	20.0%
Severe	12	24.0%
Total	50	100.0%

Table 2: Distribution Of Distance Covered By 6mwt

DISTANCE COVERED	Frequency	Percent
Normal	14	28.0%
Mildly Reduced	19	38.0%
Moderately Reduced	6	12.0%
Severely Reduced	11	22.0%
Total	50	100.0%

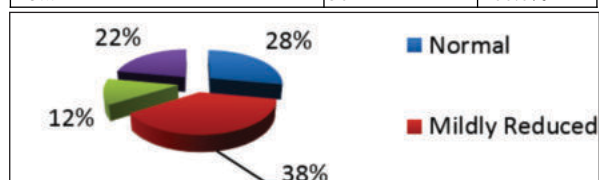


FIG 4 SHOWED: 14(28.0%) patients had normal distance covered, 19(38.0%) patients had mildly reduced distance covered, 6(12.0%) patients had moderately distance covered and 11(22.0%) patients had severely reduced distance covered.

Table 3: Distribution Of Spirometry Interpretation

SPIROMETRY INTERPRETATION	Frequency	Percent
MILD RESTRICTION	14	28.0%
MODERATE RESTRICTION	13	26.0%
NORMAL	4	8.0%

SEVERE RESTRICTION	19	38.0%
Total	50	100.0%

14(28.0%) patients had mild restriction, 13(26.0%) patients had moderate restriction, 4(8.0%) patients had normal spirometry interpretation and 19(38.0%) patients had severe restriction.

Table 4: Distribution Of Spirometry Interpretation : Dyspnea 12 Score

DYSPNEA 12 SCORE	Mild	Moderate	Severe	TOTAL
SPIROMETRY INTERPRETATION				
MILD RESTRICTION	13	1	0	14
Row %	92.9	7.1	0.0	100.0
Col %	46.4	10.0	0.0	28.0
MODERATE RESTRICTION	10	3	0	13
Row %	76.9	23.1	0.0	100.0
Col %	35.7	30.0	0.0	26.0
NORMAL	4	0	0	4
Row %	100.0	0.0	0.0	100.0
Col %	14.3	0.0	0.0	8.0
SEVERE RESTRICTION	1	6	12	19
Row %	5.3	31.6	63.2	100.0
Col %	3.6	60.0	100.0	38.0
TOTAL	28	10	12	50
Row %	56.0	20.0	24.0	100.0
Col %	100.0	100.0	100.0	100.0

Table 5: Distribution Of Mean 6 Mwt (distance Covered): Dyspnea 12 Score

		Number	Mean	SD	Minimum	Maximum	Median	p-value
6 MWT (DISTANCE COVERED)	Mild	28	342.7857	57.1893	201.0000	460.0000	348.0000	<0.0001
	Moderate	10	243.1000	71.1453	132.0000	346.0000	263.0000	
	Severe	12	133.9167	37.3593	96.0000	214.0000	126.0000	

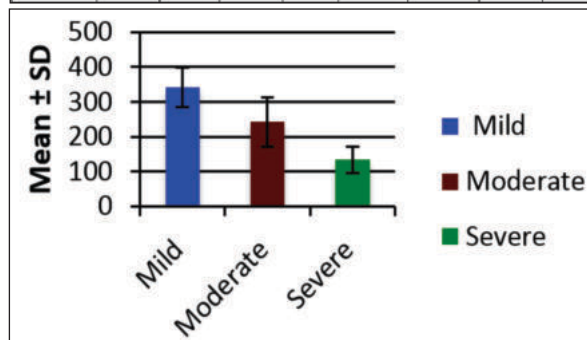


FIG 4 SHOWED: In mild dyspnea 12 score, the mean 6 MWT (distance covered) (mean $\pm$ s.d.) of patients was 342.7857 $\pm$ 57.1893. In moderate dyspnea 12 score, the mean 6 MWT (distance covered) (mean $\pm$ s.d.) of patients was 243.1000 $\pm$ 71.1453. In severe dyspnea 12 score, the mean 6 MWT (distance covered) (mean $\pm$ s.d.) of patients was 133.9167 $\pm$ 37.3593. Distribution of mean 6 MWT (distance covered) vs. dyspnea 12 score was statistically significant (p<0.0001).

Table 6: Distribution Of Mean fvc : Dyspnea 12 Score

		Number	Mean	SD	Minimum	Maximum	Median	p-value
FVC	Mild	28	1.6818	.5002	0.9000	2.8900	1.6950	<0.0001
	Moderate	10	.9942	.1802	0.8220	1.4700	0.9550	
	Severe	12	.8870	.2325	0.4200	1.1700	0.9500	

In mild dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was

1.6818 $\pm$.5002. In moderate dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was .9942 $\pm$.1802. In severe dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was .8870 $\pm$.2325. Distribution of mean FVC vs. dyspnea 12 score was statistically significant ($p < 0.0001$).

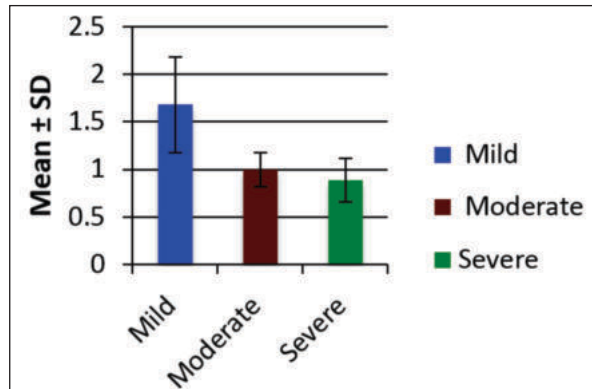


FIG 5 SHOWN: In mild dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was 1.6818 $\pm$.5002. In moderate dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was .9942 $\pm$.1802. In severe dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was .8870 $\pm$.2325. Distribution of mean FVC vs. dyspnea 12 score was statistically significant ($p < 0.0001$).

Table 7 : Distribution Of Mean fev1/fvc: Dyspnea 12 Score

		Number	Mean	SD	Minimum	Maximum	Median	p-value
6 MWT (DISTANCE COVERED)	Mild	28	342.7857	57.1893	201.0000	460.0000	348.0000	<0.0001
	Moderate	10	243.1000	71.1453	132.0000	346.0000	263.0000	
	Severe	12	133.9167	37.3593	96.0000	214.0000	126.0000	

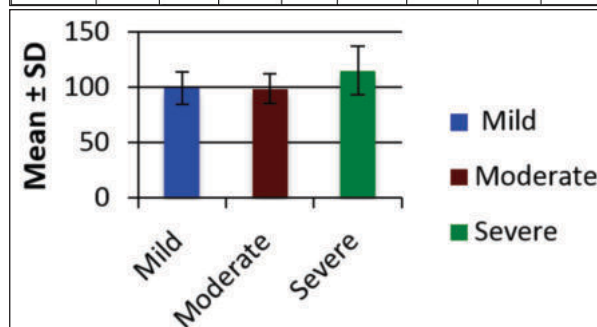


Fig 6 Shown: In mild dyspnea 12 score, the mean FEV1/FVC (mean $\pm$ s.d.) of patients was 99.3929 $\pm$ 14.8407. In moderate dyspnea 12 score, the mean FEV1/FVC (mean $\pm$ s.d.) of patients was 99.0000 $\pm$ 13.6382. In severe dyspnea 12 score, the mean FEV1/FVC (mean $\pm$ s.d.) of patients was 115.0833 $\pm$ 21.9978. Distribution of mean FEV1/FVC vs. dyspnea 12 score was statistically significant ($p = 0.0222$).

DISCUSSION

DIFFUSE PARENCHYMAL LUNG DISEASES are the group of disorders those presents with progressive dyspnea, dry cough, chest discomfort. In our study we have taken dyspnea 12 score as a measure of perceived dyspnea. It has been graded as MILD (10-20), MODERATE (20-30), AND SEVERE (>30) based on patients perception of dyspnea.

We have also performed 6 MINUTE WALK TEST AND SPIROMETRY OF all the patients. Walking distance or distance covered in 6 min calculated and association is made with dyspnea 12

score. Association between FEV1/FVC RATIO and FVC PERCENTAGES are made with dyspnea 12 score. These tests are helpful in assessment of morbidity and quality of life of the patient with DPLDS.

In our study association between dyspnea 12 score and 6 min walk test showed mild dyspnea 12 score 14 (50.0%) patients had normal, 13 (46.4%) patients had mildly reduced distance covered and 1 (3.6%) patient had moderately reduced distance covered. In moderate dyspnea 12 score, 6 (60.0%) patients had mildly reduced, 3 (30.0%) patients had moderately reduced and 1 (10.0%) patient had severely reduced distance covered. In severe dyspnea 12 score, 2 (16.7%) patients had moderately reduced and 10 (83.3%) patients had severely reduced distance covered. Association of distance covered in 6 MIN WALK TEST vs. dyspnea 12 score was statistically significant ($p < 0.0001$).

In this study association between dyspnea 12 and spirometric analysis showed: In mild dyspnea 12 score, 13 (46.4%) patients had mild restriction, 10 (35.7%) patients had moderate restriction, 4 (14.3%) patients had normal spirometry interpretation and 1 (3.6%) patient had severe restriction. In moderate dyspnea 12 score, 1 (10.0%) patient had mild restriction, 3 (30.0%) patients had moderate restriction and 6 (60.0%) patients had severe restriction. In severe dyspnea 12 score, 12 (100.0%) patients had severe restriction. Association of spirometry interpretation vs. dyspnea 12 score was statistically significant ($p < 0.0001$).

In mild dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was 1.6818 $\pm$.5002. In moderate dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was .9942 $\pm$.1802. In severe dyspnea 12 score, the mean FVC (mean $\pm$ s.d.) of patients was .8870 $\pm$.2325. Distribution of mean FVC vs. dyspnea 12 score was statistically significant ($p < 0.0001$).

In mild dyspnea 12 score, the mean 6 MWT (distance covered) (mean $\pm$ s.d.) of patients was 342.7857 $\pm$ 57.1893. In moderate dyspnea 12 score, the mean 6 MWT (distance covered) (mean $\pm$ s.d.) of patients was 243.1000 $\pm$ 71.1453. In severe dyspnea 12 score, the mean 6 MWT (distance covered) (mean $\pm$ s.d.) of patients was 133.9167 $\pm$ 37.3593.

Distribution of mean 6 MWT (distance covered) vs. dyspnea 12 score was statistically significant ($p < 0.0001$).

A study by Janelle et al described dyspnea 12 score as valid and reliable measure [2] of dyspnea severity in DPLD patients.

A similar study by Manali et al showed good positive correlation between 6 minute walking distance and dyspnea severity in IPF patients [13].

Grouped analyses of patients with FVC $\geq 50\%$ predicted in the ASCEND and INPULSIS trials [14] showed the utility of FVC as a marker of IPF progression and its sensitivity to treatment-associated change.

CONCLUSION

Patient perceived dyspnea or dyspnea 12 score has positive correlation with 6 minute walking distance covered.

Perceived dyspnea or dyspnea 12 score has positive correlation with spirometric interpretation and analysis.

Dyspnea 12 score has positive correlation with FEV1/FVC ratio, mean FVC percentage.

List of authors.

Luca Richeldi, M.D., Ph.D., Roland M. du Bois, M.D., Ganesh Raghu, M.D., Arata Azuma, M.D., Ph.D., et al., for the INPULSIS Trial Investigators

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