A Prospective Observational Study on Forced Expiratory Volume (FEV1) with Six Minute Walk Test in Patients with Chronic Obstructive Pulmonary Disease

Dr. K. Teja[1], Dr. S. Raghu[2], B. Sai Vasavi[3], G. Durga Bhavani[4], SK. Mulla Mobin[5], Dr. J. N. Suresh Kumar[6]

[1]Pharm.D, Assistant Professor, Department of Pharmacy Practice, Narasaraopet institute of pharmaceutical sciences
Email id: *tejuhannu64[at]gmail.com*
Phone no: 7981944615

[2]M.D., CHEST, Radha Krishna Chest Clinic, Guntur
Phone no: 9440181510

[3]V/VI Pharm. D, Department of Pharmacy Practice, Narasaraopet Institute of Pharmaceutical Sciences
Email.id: *saivasavibandaru[at]gmail.com*
Phone no: 7659919074, 7093456253

[4]V/VI Pharm. D, Department of Pharmacy Practice, Narasaraopet Institute of Pharmaceutical Sciences
Email.id: *durgaprasadgabbiti[at]gmail.com*
Phone no: 6281620228

[5]V/VI Pharm.D, Department of Pharmacy Practice, Narasaraopet Institute of Pharmacy Practice
Email.id: *shaikmullamobin1996[at]gmail.com*
Phone no: 7675814194

[6]Department of Pharmacy Practice, Narasaraopeta Institute of Pharmaceutical Sciences, Narasaraopet, Andhra Pradesh, India

Abstract: *Introduction: Chronic obstructive pulmonary disease (COPD) is a lung diseasecharacterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible.World Health Organization (WHO) predicted that COPD will be the third leading cause of mortality and fifth leading cause of morbidity in 2020. So assessing the disease severity and treating it appropriately is of utmost importance. Objectives: The aim of this study was to compare FEV_1 with Six-minute walk test in COPD patients. Methods: It is a prospective observational study in which 110 patients were included out of which 6 of the patients got excluded as they were unable to complete the study, so the number of patients included is 104. In the initial visit patient was advised to undergo Six-minute walk test (6MWT) after assessing FEV_1 value. After patients had taken the test, they were treated with medication and advised to visit the hospital for the follow up after 15 days. Results: From the analysis, there was increase in FEV_1% with increase in six-minute walk distance. Conclusion: In conclusion according to study Six-minute walk test (6MWT) is a cost-effective modality which can assess the lung function and response to treatment in patients suffering from chronic obstructive pulmonary disease. Also, it shows significant positive correlation with FEV_1. Therefore, it can be recommended as a screening modality to assess pulmonary function in patients suffering from COPD.*

Keywords: COPD, FEV_1, Six-minute walk test

1. Introduction

Chronic Obstructive Pulmonary Disease
Lung disease refers to several types of diseases or disorders that prevent the lungs from functioning properly. Lung disease can affect respiratory function, or the ability to breathe, and pulmonary function, which is how well lungs work. Chronic lower respiratory diseases is a set of conditions that includes chronic obstructive pulmonary adisease (COPD), emphysema, and chronic bronchitis. Respiratory diseases such as asthma and COPD involve a narrowing or blockage of airways that reduce air flow.[1]

Definition:
Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible. The more familiar terms 'chronic bronchitis' and 'emphysema' are no longer used, but are now included within the COPD diagnosis.

Types of COPD:
There are two main forms of COPD:

1) Chronic bronchitis.
2) Emphysema.

Chronic Bronchitis:
Bronchitis is an inflammation of the bronchial tubes, the airways that carry air to your lungs. It causes cough that often brings up mucus. It can also cause shortness of breath, wheezing, low fever, and chest tightness. There are two main types of bronchitis, acute and chronic.

Chronic bronchitis is a type of COPD (chronic obstructive pulmonary disease) where the inflamed bronchial tubes produce a lot of mucus. This leads to coughing and difficulty in breathing. Cigarette smoking is the most common cause. Breathing in air pollution, fumes, or dust over a long period of time may also cause it.
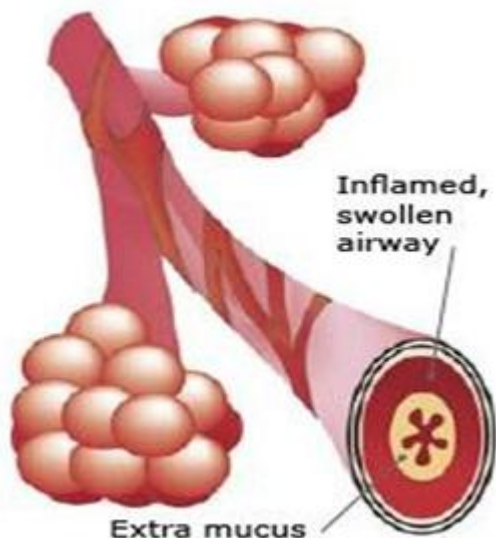

Figure 01: Condition of bronchitis

Emphysema:

Emphysema is also a type of chronic obstructive pulmonary disease (COPD) and involves the enlargement of the air sacs in the lung. The alveoli at the end of the bronchioles of the lung become enlarged because of the breakdown of their walls. The fewer and larger damaged sacs mean there is a reduced surface area for the exchange of oxygen into the blood and carbon dioxide out of it.

The damage is permanent, not reversible and it causes reduced respiratory function and breathlessness. The damage takes a number of forms the sacs can be destroyed, narrowed, collapsed, stretched or over-inflated.
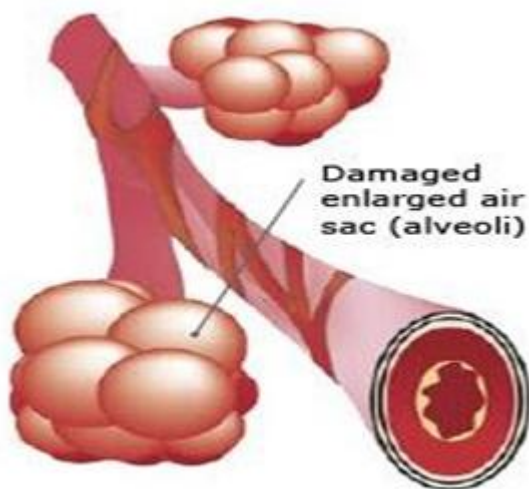

Figure 02: Condition of emphysema

Spirometry:

Spirometry is the term given to the basic lung function tests that measure the air that is expired and inspired. There are three basic related measurements: volume, time and flow. Spirometry is objective, non-invasive, sensitive to early change and reproducible. With the availability of portable meters, it can be performed almost anywhere and, with the right training, it can be performed by anybody. It is performed to detect the presence or absence of lung disease, quantify lung impairment, monitor the effects of occupational/environmental exposures and determine the effects of medications.[8]

Staging of COPD according to Gold Guidelines
- GOLD 1—Mild: $FEV1 \geq 80\%$ predicted
- GOLD 2—Moderate: $50\% \leq FEV1 < 80\%$ predicted
- GOLD 3—Severe: $30\% \leq FEV1 < 50\%$ predicted
- GOLD 4—Very severe: $FEV1 < 30\%$ predicted

American Thoracic Society (ATS) recommends that the equipment should be such that it meets the minimum standards.
- Should record 7 litres volume and 12 L/second flow rate
- Should be calibrated with a 3Lsyringe
- Should record minimum FVC andFEV1
- Should record flow volume curve or flow volume loop or both

American Thoracic society (ats) recommendations for performing spirometry

Effort: Maximal, smooth and cough-free
Position: Sitting
Exhalation time: 6 seconds
End of test: 2 second volume plateau
Reproducibility: FVC within 5% in three acceptable tests

Six Minute Walk Test

The 6MWT is a practical simple test that requires a 100-ft hallway but no exercise equipment or advanced training for technicians. Walking is an activity performed daily by all but the most severely impaired patients. This test measures the distance that a patient can quickly walk on a flat, hard surface in a period of 6 minutes (6MWD).

The self-paced 6MWT assesses the submaximal level of functional capacity. Most patients do not achieve maximal exercise capacity during the 6MWTinstead, they choose their own intensity of exercise and are allowed to stop and rest during the test. However, because most activities of daily living are performed at submaximal levels of exertion, the 6MWD may better reflect the functional exercise level for daily physical activities.

Before the 6MWT

Ensure to obtain a medical history of the patient and have taken into account any precautions or contraindications to exercise testing.
- Instruct the patient to dress comfortably, wear appropriate footwear and to avoid eating for at least one hour before the test (where possible or appropriate).
- Any prescribed inhaled bronchodilator medication should be taken within one hour of testing or when the patient arrives for testing.
- The patient should rest for at least 15 minutes before beginning the 6MWT.[8]

- **Record:** Blood pressure, heart rate, oxygen saturation, Dyspnea score.

Note: Show the patient the Dyspnea scale (i.e., Borg scale) and give standardized instructions on how to obtain a score.

Before the Test
The oximeter is to be attached to the patient so it is ready to be checked throughout the test without interfering with walking pace.

Describe the walking track to the patient and then give the patient the following instructions:

The aim of this test is to walk as far as possible for 6 minutes. Walk along this hallway between the markers, as many times as you can in 6 minutes. 6 minutes is a long time to walk, so patients will be exerting themselves. So patients are permitted to slow down, to stop, and to rest as necessary, but please resume walking as soon as you are able.

Remember that the objective is to walk **AS FAR AS POSSIBLE** for 6 minutes, but don't run or jog. Ask the patients they had any questions.

During the Test
Monitor the patient for untoward signs and symptoms.
Use the following standard encouragements during the test:
- At 1 min "You are doing well. You have 5 minutes to go."
- At 2 min "Keep up the good work. You have 4 minutes to go."
- At 3 min "You are doing well. You are halfway."
- At 4 min "Keep up the good work. You have only 2 minutes left."
- At 5 min "You are doing well. You have only 1 minute to go."
- At 6 min "Please stop where you are."

If the patient stops during the test, every 30 s once SpO2 is >85% "Please resume walking whenever patient feel able."
Continuous monitoring of SpO_2 and HR should be performed during the test and results recorded each minute. If the Nadir (lowest) SpO_2 is observed at a different time-point then this should also be recorded as it is an important prognostic indicator.

At the End of the 6MWT
- Put a marker on the distance walked.
- Seat the patient or, if the patient prefers, allow to the patient to stand.
- Immediately record oxygen saturation (SpO2)%, heart rate and dyspnoea rating on the 6MWT recording sheet.

It is important to understand the reason for test termination/limitation, so patients should be asked why they could not walk any further.

Measure the excess distance with a tape measure and tally up the total distance. The patient should remain in a clinical area for at least 15 minutes following an uncomplicated test.[9]

Stop the Test in the Event of Any of the Following
- Chest pain suspicious for angina.
- Evolving mental confusion or lack of coordination.
- Evolving light-headedness.
- Intolerable dyspnea.
- Leg cramps or extreme leg muscle fatigue.
- Persistent $SpO_2 < 80\%$. (In a community setting the test may be stopped if SpO2 < 85%)

Predicted Normal Values for the 6MWT
Predictive equation for males: $6MWD(m) = 867 - (5.71 \text{ age, yrs}) + (1.03 \text{ height, cm})$
Predictive equation for females: $6MWD(m) = 525 - (2.86 \text{ age, yrs}) + (2.71 \text{ height, cm}) - (6.22 \text{ BMI})$.

Indications for the Six-Minute Walk Test
The strongest indication for the 6MWT is for measuring the response to medical interventions in patients with moderate to severe heart or lung disease. The 6MWT has also been used as a one-time measure of functional status of patients, as well as a predictor of morbidity and mortality. Formal cardiopulmonary exercise testing provides a global assessment of the exercise response, an objective determination of functional capacity and impairment, determination of the appropriate intensity needed to perform prolonged exercise, quantification of factors limiting exercise, and a definition of the underlying pathophysiologic mechanisms such as the contribution of different organ systems involved in exercise. The information provided by a 6MWT should be considered complementary to cardiopulmonary exercise testing, not a replacement for it. patients with end-stage lung diseases . In some clinical situations, the 6MWT provides information that may be a better index of the patient's ability to perform daily activities than is peak oxygen uptake; for example, 6MWD correlates better with formal measures of quality of life . Changes in 6MWD after therapeutic interventions correlate with subjective improvement in dyspnea. [10]

Pre-treatment and post treatment comparison: Lung transplantation, Lung resection, Lung volume reduction surgery, Pulmonary rehabilitation, COPD, Pulmonary hypertension, Heart failure .

Functional status (single measurement): COPD, Cystic fibrosis, Heart failure Peripheral vascular disease, Fibromyalgia, Older patients

Predictor of morbidity and mortality: Heart failure, COPD, Primary pulmonary hypertension

Absolute contraindications for the 6MWT include the following:
Unstable angina during the previous month and myocardial infarction during the previous month. Relative contraindications include a resting heart rate of more than 120, a systolic blood pressure of more than 180 mm Hg, and a diastolic blood pressure of more than 100 mm Hg. Patients with any of these findings should be referred to the physician ordering or supervising the test for individual clinicalassessment and a decision about the conduct of the test.

The results from a resting electrocardiogram done during the previous 6 months should also be reviewed before testing. Stable exertional angina is not an absolute contraindication for a 6MWT, but patients with these symptoms should perform the test after using their anti-angina medication, and rescue nitrate medication should be readily available.

2. Aim and Objectives

Aim of the study: To compare Forced expiratory volume (FEV1) with six minute walk test (6MWT) in patients with Chronic Obstructive Pulmonary Disease.

Objectives of the study:
- To find better therapeutic outcome in COPD patients comparing spirometry and six minute walk test.
- To find out the severity of COPD.
- To know the better test for patients over the two tests performed.
- To assess pulmonary function status in individual patients before and after the treatment.

3. Materials and Methods

Study Site:
This study was conducted at pulmonology hospital, Guntur. The patients approaching to outpatient department were enrolled.A total of 104 patients from the out-patient department of pulmonology who fulfilled the exclusion and inclusion criteria were enrolled.

Study design: Prospective observational study.

Inclusion Criteria:
- Patients who are suffering from COPD.
- Both male and female patients with age group in between 40- 80 years.

Exclusion Criteria:
- Patients above 80 years of age.
- Patients who are not willing to participate in the study were excluded.
- Patients with Active pulmonary tuberculosis.
- Patients with unstable cardiac arrhythmia were also excluded from the study.

Study Period: Study was conducted for a period of 6 months from June 2019 -November 2019.
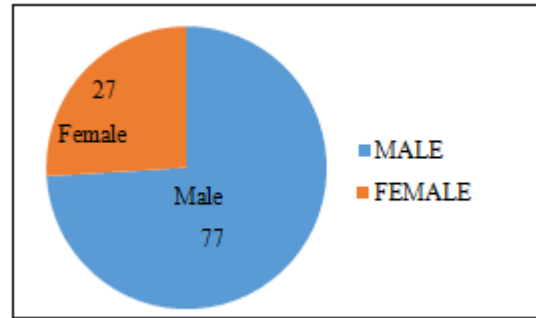
4. Results

1) Distribution of Patients Based on Gender:

Table 01: Distribution of patients based on gender

S. No.	Gender	No. of Patients n=104	Percentage (%)
1.	Male	77	74.03
2.	Female	27	25.96

Table 01 shows distribution of patients based on gender. Among the total patients enrolled there were 77 males (74.03%) and 27 females (25.96 %).
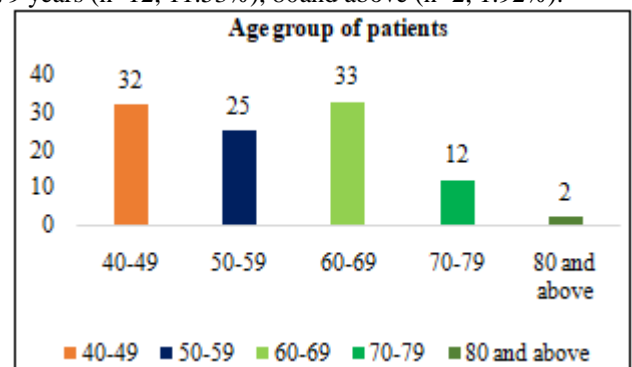

Figure 03: Distribution of patients based on gender

2) Distribution of Patients Based on Age Group

Table 02: Distribution of patients based on Age group

S. No.	Age Group (years)	No. of patients	Percentage (%)
1.	40-49	32	30.7
2.	50-59	25	24.03
3	60-69	33	31.73
4.	70-79	12	11.53
5.	80 and above	2	1.92

Table 02 shows age group of patients who were included in the study. Majority of the patients fall between the age group 60-69 years (n=33, 31.73%) where there are more chances of COPD progression, followed by age group 40-49 years (n=32, 30.7%), 50-59 years (n=25, 24.03%), then 70-79 years (n=12, 11.53%), 80and above (n=2, 1.92%).

Figure 04: Distribution of patients based on age group

3) Distribution of Patients Based on Social History

Table 3: Distribution of patients based on social history

S. No.	Social History	No. of patients	Percentage (%)
1	Smokers	42	40.38
2	Alcoholic	1	0.96
3	Smoker + Alcoholic	13	12.5
4	Ex-Smoker	7	6.73
5	Ex-smoker/Ex-Alcoholic	3	2.88
6	Non-smoker /Non alcoholic	38	36.5

Table 03 shows thedistribution of patients based on social history. There were 42 smokers (40.38%), 38 non-smokers/non-alcoholics (36.5%), 13 Smoker +Alcoholic (12.5%), 7 ex- smokers (6.73%), 3 ex-smoker/ex-alcoholic (2.88%) and 1 Alcoholic (0.96%).
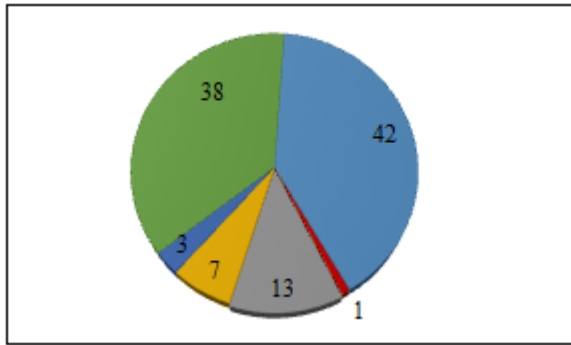
Figure 05: Distribution of patients based on social history

4) Distribution of Patients based on Occupation

Table 04: Distribution of patients based on occupation

S. No	Occupation	No. of patients	Percentage (%)
1	Farmers	40	38.46
2	Miscellaneous	17	16.34
3	Home makers	13	12.50
4	Daily Wagers	10	9.61
5	Business persons	9	8.65
6	Carpenters	6	5.76
7	Un employed	5	4.80
8	Tractor drivers	2	1.92
9	Rice mill workers	2	1.92

Table 04 shows distribution of patients based on occupation. Majority of the patients were found to have their occupation as farmers (n=40, 38.46%) , miscellaneous (n=17, 16.34%) homemakers (n=13, 12.50%), daily wagers (n=10, 9.61%), business persons (n=9, 8.65%), carpenters (n=6, 5.76%), Un employed (n=5,4.80 %), tractor drivers (n=92%)followed by rice mill workers (n=2, 1.92%).
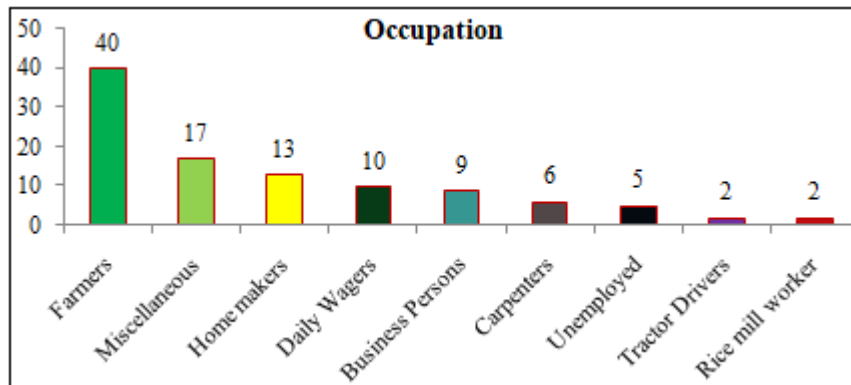

Figure 06: Distribution of patients based on occupation

5) Severity of COPD according to Gold Guidelines

Table 05: Severity of COPD according to GOLD guidelines

SNO	Severity	No. of Patients	Percentage (%)
1.	Mild	7	6.73
2.	Moderate	59	56.73
3.	Severe	34	32.69
4.	Very Severe	4	3.84

Table 05 shows the severity of COPD in patients included in the study, among which majority of patients were found to have moderate COPD (n=59 ,56.73%) followed by Severe COPD (n=34 ,32.69%), Mild COPD (n=7 ,6.73%) and very severe (n=4 ,3.84%).
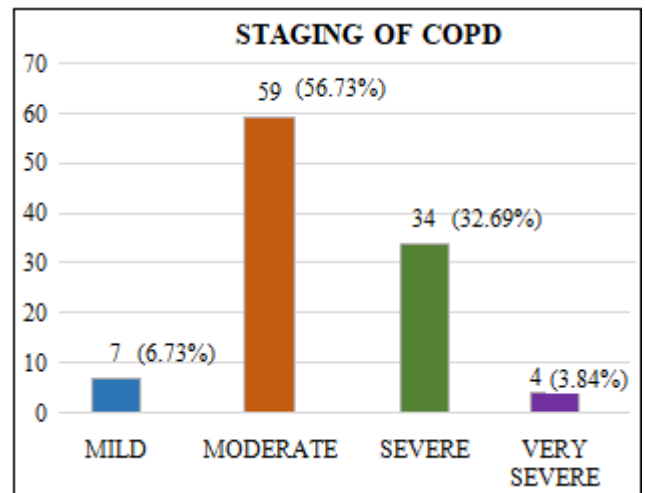

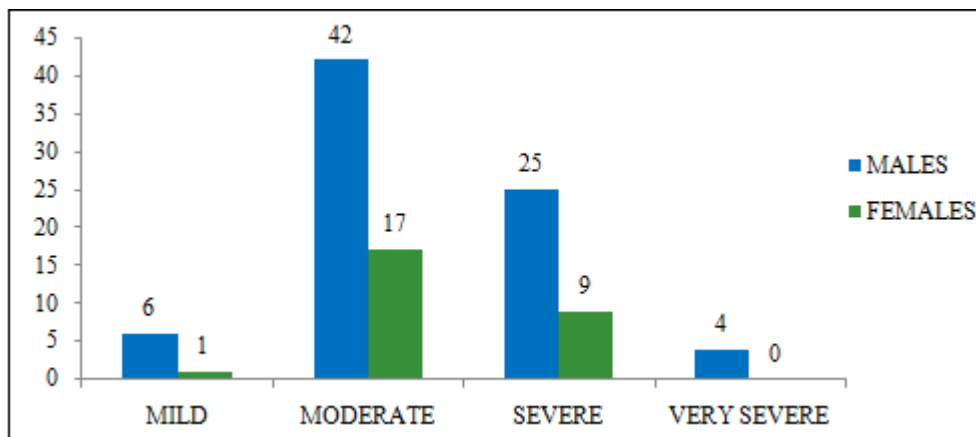**Figure 7:** Severity of COPD according to GOLD guidelines

6) Severity of COPD according to Gender:

Table 06: Severity of COPD according to gender.

S. No	Severity	No.of subjects		Percentage (%)	
		Males	Females	Males	Females
1	Mild	6	1	5.76	0.96
2	Moderate	42	17	40.38	16.34
3	Severe	25	9	24.03	8.65
4	Very Severe	4	0	3.84	0

Table 06 shows severity of COPD based on gender .Among the patients enrolled, 6 males (5.76%) and 1 female (0.96%) had mild COPD, 42 males (40.38%) and 17 females (16.34%) had moderate COPD , 25 males (24.03%) and 9 females(8.65%) had severe COPD and 4 males(3.84%) had very severe COPD.


Figure 8: Severity of COPD according to gender.

7) Distance Walked During Six Minute Walk Test (6MWT):

Table 07: Distance walked during Six MinuteWalk test.

SNo	Distance walked (metres)	No.of Patients	Percentage (%)
1	101-150	4	3.84
2	151-200	0	0
3	201-250	10	9.61
4	251-300	31	29.80
5	301-350	41	39.42
6	351-400	15	14.42
7	401-450	3	2.88

Table 07 shows distance walked by subjects during six minute walk test(6MWT) .Out of total 104 patients, 4 patients have walked a distance of 100-150 metres (3.84%) ,10 patients have walked a distance of 201-250 metres (9.61%) , 31 patients have walked a distance 251-300 metres (29.80%), 41 patients have walked a distance of 301-350 metres(39.42%) ,15 patients have walked a distance of 351-400 metres (14.42%),3 patients have walked a distance of 401-450 metres (2.88%).
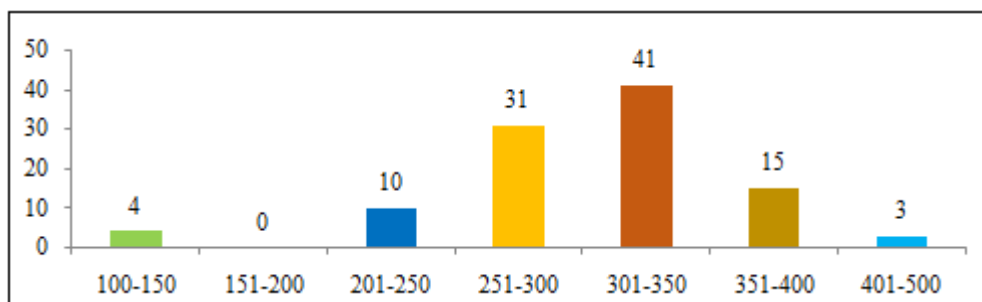
Figure 09: Distance walked during six minute walk test

8) Mean FEV1 % of Males and Females in Pre-Treatment and Post –Treatment.

Table 8: Mean FEV_1 % of males and females in Pre and Post treatment.

SNo	Gender	Mean FEV_1 %		Mean FEV 1 % improved
		Pre-treatment	Post-treatment	
1	Males(n=77)	53.37	53.94	0.57(p=0.44)
2	Females(n=27)	55.00	55.61	0.61(p=0.58)

Table 8 shows Mean FEV_1 % of males and females in pre and post treatment. In Pre treatment, Mean FEV_1 % in males was found to be 53.37 where as in females it was 55.00. In post treatment, Mean FEV_1 % in males was found to be 53.94 where as in females it was 55.61.

Mean FEV_1 % in males was improved by 0.57% (p=0.44) where as in females it was improved by 0.61 % (p=0.58).
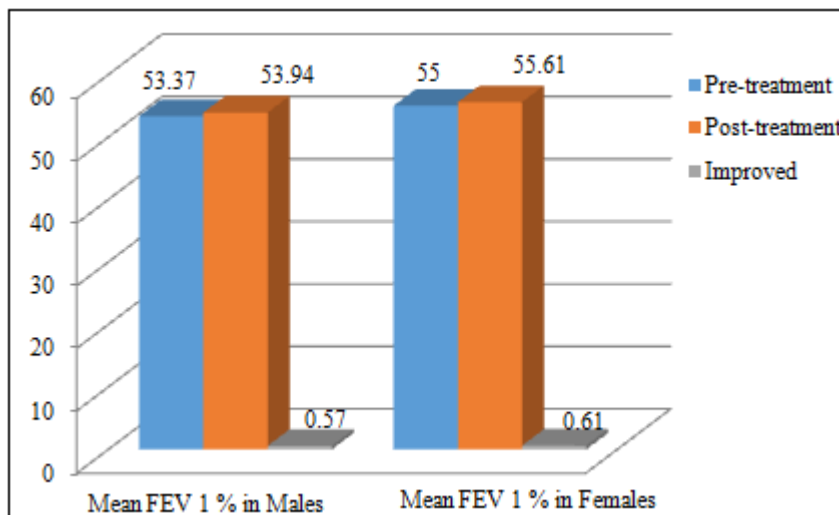
Figure 10: Mean FEV$_1$ % in males and females in Pre and Post treatment

9) Mean Six Minute Walk Distance (6MWD) of Males and Females in Pre-Treatment and Post – Treatment:

Table 9: Mean 6MWD of males and females in pre and post treatment

S No.	Gender	Mean 6MWD(metres)		Mean 6MWD Improved
		Pre-treatment	Post-treatment	
1	Males (n=77)	302.77	316.48	13.71mts(p=0.04)
2	Females (n=27)	305.11	316.62	11.51 mts(p=0.02)

Table 09 shows Mean 6MWD covered by patients during 6MWT .The distance covered by males in pre-treatment was 302.77 metres and females were 305.11 metres. The distance covered by males in post-treatment was 316.48 metres and females were 316.62 metres. Mean 6MWD improved in males was 13.71 metres (p=0.04) and in females was 11.51 metres (p=0.02).
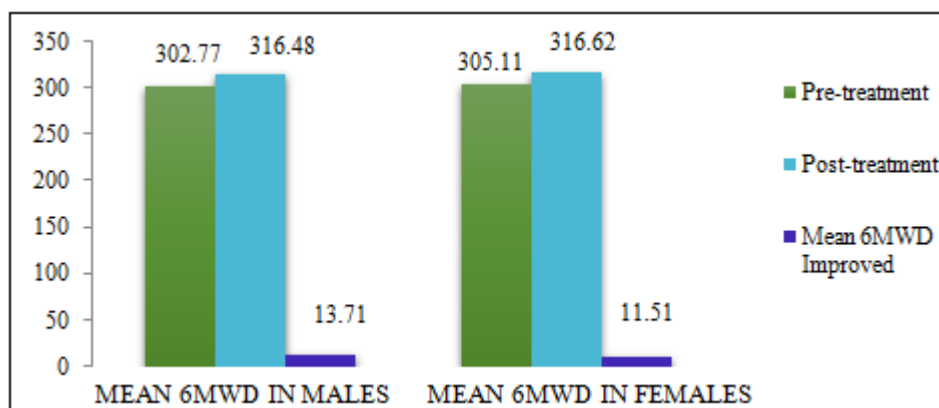

Figure 11: Mean 6MWD of males and females in pre and post treatment

10) Assessment of Dyspnea Severity by using Borg Scale

Pre-Treatment

Table 10: Dyspnea severity in Pre-treatment

Grade	Severity	No. of patients	Percentage (%)
0.5	Extremely slight	3	2.88
1	Very slight	4	3.84
2	Slight	12	11.53
3	Moderate	20	19.23
4	Somewhat severe	20	19.23
5	Severe	26	25
7	Very severe	16	15.3
9	Extremely severe	3	2.88

Table 10 shows grading and severity of dyspnea by using Borg dyspnea scale. In present study 3 patients had extremely slight dyspnea (2.88%), 4 patients had very slight dyspnea (3.84%), 12 patients had slight dyspnea (11.53%) , 20 patients had moderate dyspnea (19.23%), 20 patients had somewhat severe dyspnea (19.23%), 26 patients had severe dyspnea (25%), 16 patients had very severe dyspnea (15.3%), 3 patients had extremely severe dyspnea (2.88%).
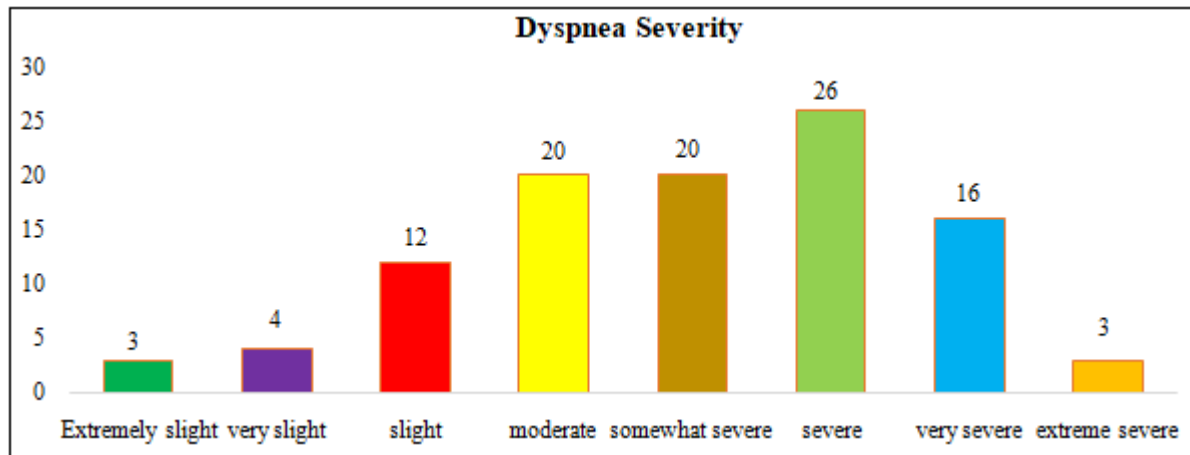
Figure 12: Dyspnea severity in Pre-treatment

11) Post-Treatment:

Table 11: Dyspnea in Post-treatment

Grade	Severity	No. of Patients	Percentage (%)
0.5	Extremely slight	2	1.92
1	Very slight	5	4.80
2	Slight	18	17.30
3	Moderate	23	22.11
4	Somewhat severe	18	17.30
5	Severe	22	21.15
7	Very severe	14	13.46
9	Extreme severe	2	1.92

Table 11 shows severity of dyspnea in post-treatment. In present study 2 patients had extremely slight dyspnea (1.92%), 5 patients had very slight dyspnea (4.80%), 18 patients had slight dyspnea (17.30%), 23 patients had moderate dyspnea (22.11%), 18 patients had somewhat severe dyspnea (17.30%), 22 patients had severe dyspnea (21.15%), 14 patients had very severe dyspnea (13.46%), 2 patients had extremely severe dyspnea (1.92%).
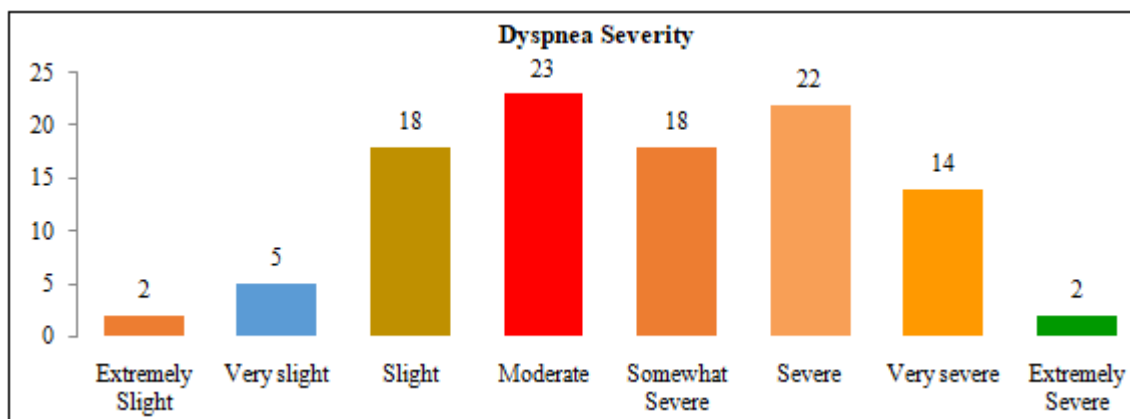

Figure13: Dyspnea severity in post-treatment

5. Discussion

Chronic Obstructive pulmonary disease (COPD) remains a major health problem. It is the fourth leading cause of chronic morbidity and mortality, and is projected to rank fifth in 2020 in burden of diseases worldwide, according to a study published by World Health Organization (WHO). Airflow limitation is best measured by spirometry, because this is most widely available, reproducible test of lung function COPD often develops in long time smokers in middle age, patients often have a variety of other diseases related to either smoking or ageing .It should be managed with careful attention also paid to comorbidities and their effect on the patient's quality of life. A careful differential diagnosis and comprehensive assessment of severity should be performed in every patient with chronic air flow limitation. Six-minute walk test (6MWT) is a simple, cheap, reliable, easily acceptable and submaximal exercise test. It gives information regarding functional capacity, response to therapy and prognosis in chronic obstructive pulmonary disease (COPD).[13]6MWT is more reproducible than forced expiratory volume in 1 second (FEV1).The facility of spirometry is not available in many rural areas of India because of lack of infrastructure where 6MWT can be done easily. 6MWT can be a useful replacement of spirometry for assessing severity of COPD. 6MWT was done according to American Thoracic Society (ATS) guidelines. A total of 110 patients were taken for the study out of which 104 were only included. Among 104 patients 74.03% (n=77) were males and 25.96 % (n=27) A Prospective observational study on Forced Expiratory Volume (FEV1) with Six Minute Walk Test in patients with Chronic Obstructive Pulmonary Disease. Department of Pharmacy Practice , NIPS Page 49 were females (see table 01). When taken their age group into consideration majority were among the age group of 60-69, 31.73% (n=33) followed by age group 40- 49, 30.70%

(n=32), 50-59 24.03 % (n= 25 , 70-79 , 11.53% (n= 12) , 80 and above 1.92 % (n=2) (see table 02). Out of 104 patients smokers were 40.38 % (n=42), followed by Non-smoker/ Non-alcoholic 36.5 % (n=38) smoker + alcoholic were 12.5 % (n=13), ex-smokers were 6.73 % (n=7), ex-smoker / ex alcoholic were 2.88% (n=3), and alcoholic were 0.96 % (n=1) (see table 03). When taken their occupation into consideration majority were found as farmers (n=40, 38.46%), followed by miscellaneous (n=17, 16.34%), homemakers (n=13, 12.50%), daily wagers (n=10, 9.61%), business persons (n=9, 8.65%), carpenters (n=6, 5.76%), Un employed (n=5,4.80 %), tractor drivers (n=2, 1.92%), and rice mill workers (n=2, 1.92%) (See table 04). According to GOLD guidelines for assessing COPD severity out of 104 patients 56.73% (n=59) were having moderate COPD, 32.69 % (n=34) were having severe COPD, 6.73 % (n=7) were having mild COPD , 3.84 % (n=4) were having very severe COPD (see table 05). By assessing severity of COPD according to gender 40.38 % males (n=42) and 16.34 % females (n=17) have moderate COPD. 24.03% males (n=25) and 8.65% females (n=9) have severe COPD, 5.76% males (n=6), 0.96% females (n=1) have mild COPD, 3.84 % males (n=4) and 0 females have very severe COPD (see table 06).

In our study 3.84 % (n=4) of patients have walked a distance of 101-150 metres, 9.61 % (n=10) of patients have walked a distance of 201-250 metres , 29.80 % A Prospective observational study on Forced Expiratory Volume (FEV1) with Six Minute Walk Test in patients with Chronic Obstructive Pulmonary Disease. Department of Pharmacy Practice , NIPS Page 50 (n=31) patients have walked a distance of 251-300 metres, 39.42 % (n=41) patients have walked a distance of 301-350 metres, 14.42 % (n=15) patients have walked a distance of 351-400 metres , 2.88 % (n=3) patients have walked a distance of 401-450 metres (see table 07). By taking mean values of FEV1 % in pre-treatment and post-treatment in both the genders Mean FEV1 % of males in pre-treatment was 53.37 % and in females was 55.00 % . Mean FEV1 % of males in post-treatment was 53.94 % and in females was 55.61 %. Mean FEV1 % was increased by 0.57 % (p=0.44) in males and 0.61 % in females (p=0.58).There was significant increase of FEV1 % in females than males (see table 08). By taking mean six-minute walk distance (6MWD) covered during six-minute walk test in pre -treatment and post-treatment, mean 6MWD in pre-treatment was 302.77 metres in males and 305.11in females, and in post-treatment was 316.48 metres in males and 316.62 metres in females. Mean 6MWD improved significantly in females than males (see table 09). By assessing dyspnea status using Borg dyspnea scale in pre-treatment 3 patients had extremely slight dyspnea (2.88%), 4 patients had very slight dyspnea (3.84%), 12 patients had slight dyspnea (11.53%), 20 patients had moderate dyspnea (19.23%), 20 patients had somewhat severe dyspnea (19.23%), 26 patients had severe dyspnea (25%), 16 patients had very severe dyspnea (15.3%), 3 patients had extremely severe dyspnea (2.88%) (See table 10).In post-treatment 2 patients had extremely slight dyspnea (1.92%), 5 patients had A Prospective observational study on Forced Expiratory Volume (FEV1) with Six Minute Walk Test in patients with Chronic Obstructive Pulmonary Disease. Department of Pharmacy Practice, NIPS Page 51 very slight dyspnea (4.80%), 18 patients had slight

dyspnea (17.30%), 23 patients had moderate dyspnea (22.11%), 18 patients had somewhat severe dyspnea (17.30%), 22 patients had severe dyspnea (21.15%), 14 patients had very severe dyspnea (13.46%), 2 patients had extremely severe dyspnea (1.92%) (See table 11). In other studies, also it is shown that 6 MWD is a sensitive indicator to measure the response to treatment with inhaled medication. Following healthy life style and avoiding certain chemical inhalations, exposure to dust and smoking habit can reduce disease progression. In a study conducted by Hajare RB et al significant positive correlation was found between 6MWD and FEV1 statistically. In other study conducted by Sachin R Agarwal et al strong positive correlation was found between 6MWD and FEV1 %.

6. Conclusion

6MWT has emerged as an important and relatively simple test which is useful to assess degree of dysfunction, prognosis and response to drug therapy in patients who are with moderate to severe pulmonary conditions. By assessing the prognosis of disease we can reduce hospitalization and treatment cost. Hence, the aim of providing patient quality of life can be achieved by counseling them about changes in lifestyle with dietary modifications.

As per some studies 6MWT is not affected with age, gender and severity. But as per our study we conclude that gender may be a significant factor more likely that males are at higher risk than females due to smoking which eventually leads to progression of COPD. In a country like India where medical burden on individual patients plays a major role 6MWT is cost effective and can be done easily.

Abbreviations Used:
COPD: Chronic Obstructive Pulmonary Disease
WHO: World Health Organization,
FEV_1 **:** Forced Expiratory Volume in one second
6MWT: Six Minute Walk Test
6MWD: Six Minute Walk Distance
GOLD: Global Initiative for Chronic Obstructive Lung Disease.

References

[1] Introduction (internet) National Institute of Environmental Health Sciences https://www.niehs.nih.gov/health/topics/conditions/lung-disease/index.cfm

[2] V.C Moore et al "Spirometry step by step" European Respiratory journal Breathe 2012 8: 232-240; DOI: 10.1183/20734735.0021711.

[3] Lung Foundation Australia: Six – Minute Walk Test, Pulmonary Rehabilitation tool Kit.

[4]   American Thoracic Society (ATS) , ATS Statement : Guidelines for the Six-Minute Walk Test, March 2002. American Journal of Respiratory and Critical Care Medicine AM J Respir Crit Care Med Vol 166. Pp 111-117, 2002.DOI: 10.1164/rccm.166/1/111.

[5]   Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines: Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease (2019 Report).

[6]   Ruchita B. Hajare et al (2019) "Correlation between 6-minute walk distance an spirometry parameters in stable chronic obstructive pulmonary disease patients" International Journal of Research in Medical sciences, January 2019, Vol 7, Issue 1 .

[7]   Prasad C N et al [2018] "Role of six-minute walk test in the evaluation of patients with chronic respiratory diseases" Perspectives in Medical Research, May-August 2018, Vol 6, Issue 2.

[8]   Baskaran Chandrasekaran et al (2018) "Six-Minute Walk Test as a Guide for Walking Prescription for Patients with Chronic Obstructive Pulmonary Diseases". Indian Journal of Respiratory Care (IJRC), July – December 2018 ,Vol 7, Issue 2 .

[9]   Beena Thomas et al (2016) " Study to find out the efficacy of 6-minute walk test in assessing response to medical intervention in chronic obstructive pulmonary disease patients" International Journal of Advances in Medicine Thomas B et al. Int J Adv Med. 2016 Aug;3(3):538-541 http://www.ijmedicine.com.

[10] Lalita Fernandes et al (2016)"Reference equation for Six-minute walk test in healthy western Indian population" Journal of Clinical and Diagnostic Research ,Vol 10(5), May 2016 P 0001-0004.

[11] Abhijit Kundu et al (2015) "Correlation of six-minute walk test with spirometric indices in Chronic obstructive pulmonary disease patients" The Journal of Association of Chest Physicians | Jan-Jun 2015 | Vol 3 | Issue 1.

[12] Ramanathan Palaniappan Ramanathan et al [2014] "Reference equations for 6-min walk test in healthy Indian subjects (25-80 years)" Lung India ,Vol 31 , Issue 1 Jan - Mar 2014.

[13] JannekeAnnegarn et al (2012) "Differences in walking pattern during 6-Min walk test between patients with COPD and Healthy Subjects, Public library of science journal (PLOS) May 2012,vol 7 issue 5.

[14] Klaus F Rabe et al (2007) " Global strategy for the diagnosis ,management and prevention of Chronic Obstructive Pulmonary Disease ,GOLD executive summary, American journal of respiratory and critical care medicine vol 176 , Am J Respir Crit Care Med Vol 176 pp 532-555, 2007.