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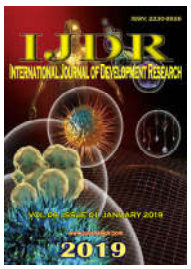

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

CORRELATION OF 4 METER GAIT SPEED WITH 6 MWD IN COPD PATIENTS-A CROSS SECTIONAL STUDY

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ABSTRACT

Study objective: To Correlate of 4-meter gait speed with 6 MWD in COPD patients. **Materials and methods:** 50 diagnosed COPD patients underwent 4-meter gait speed test and six minute walk test by two examiners. Data obtained from both the tests was correlated. **Design:** Prospective observational study. **Setting:** Inpatient Pulmonary Rehabilitation setup Time duration: Three months Participants: 50 diagnosed COPD patients. **Conclusion:** There is a weak positive correlation between 4-meter gait speed and Six minute walk distance in COPD patients

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INTRODUCTION

Chronic Obstructive Pulmonary Disease is a leading cause of mortality and morbidity in India. GOLD (Global initiative for Chronic Obstructive Lung Disease) 2018 has defined COPD as, "a common preventable and treatable disease characterized by persistent respiratory symptoms and airflow limitation that is due to alveolar and/or airway abnormality usually caused due to exposure to noxious gases and particle (Global Initiative for Chronic Obstructive Lung Disease, 2018)". The prevalence has increased over past few years. In the world COPD is already the fourth leading cause of death (WHO; 2016). In India, prevalence of COPD is 5% in men and 3.2% in females above age 35 years (Vijayan, 2013). The most common cause being smoking in males and household smoke (chulha) and dust exposure in females (Parvaiz, 2013). Patients with COPD usually experience poor quality of life because of decreased exercise tolerance, dyspnea and cough. Poor quality of life leads to anxiety and depression. All these factors contribute to the inactive lifestyle. The vicious cycle of inactivity and decreased exercise tolerance continues leading to further deterioration of health (David, 2010). To break this cycle patients are enrolled in "Pulmonary Rehabilitation" programs. Pulmonary Rehabilitation is defined as, "a comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies which include, but are not limited to, exercise training, education and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviors" (An Official American Thoracic Society, 2013). In Pulmonary Rehabilitation program patients are engaged in various physical therapy interventions. It helps patients break the vicious cycle of deconditioning, decreased exercise capacity and dyspnea. A Cochrane systemic review on pulmonary rehabilitation concluded that, "Rehabilitation relieves dyspnea and fatigue, improves emotional function and enhances patients' control over their condition. These improvements are moderately large and clinically significant.

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Rehabilitation forms an important component of the management of COPD" (An official European Respiratory Society, 2014). Field walking tests are routinely used in pulmonary rehabilitation to assess the exercise capacity of subject. It also helps the therapist to assess the effectiveness of the treatment over time. Six minute walk test is a validated and reliable test used in Pulmonary Rehabilitation programs. This test demands walking on a 100m hallway for six minutes. The distance covered in a six minute walk test is an important indicator of health, health related quality of life and also the effect of therapy. Though patient is instructed to walk "as far as" possible and not as "as fast as", the distance is highly affected by the speed of walking. Decreased strength of lower limb muscles, poor oxygen extraction capacity of muscles and dyspnea limits the speed of walking in these patients (An official European Respiratory Society, 2014). 4m gait speed is a tool that correlates well with measures of exercise capacity and health status (Karpman, 2014). Gait speed of less than $0.8m/s^2$ is associated with significant health risk in COPD patients. 4mgait is speed test is easy to carry out and can easily be performed by patients even with severe disease (Konn, 2013). 4m gait speed test requires less time, less space and is easy to perform for the patient. This tool being feasible can be used to evaluate exercise capacity and to see the effect of treatment in severe COPD patients. Thus we aim at finding the correlation between the two so that, whenever it is not possible for the patient to perform 6MWT, 4m gait speed can give a direction about exercise capacity and effect of treatment.

MATERIAL AND METHODS

50 diagnosed COPD patients were enrolled study. Patients were classified into mild, moderate and severe groups according to GOLD's criteria. Moderate and severe COPD patients were enrolled in the study. Patients with mild COPD were excluded from the study considering minimal affection of gait speed.

Inclusion Criteria

- Diagnosed moderate and severe COPD patients on GOLD's criteria

Exclusion Criteria

- Mild COPD patients
- Patients with musculoskeletal impairments who are not able to perform 6MWT eg. Severe Osteoarthritis knee
- Patients with history of recent MI
- Patients with Cardiac Arrhythmia
- Patients with known neurological disease who are not able to perform 6MWT

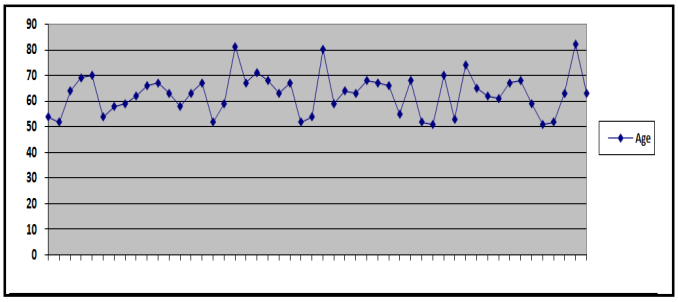
Patients underwent examination from pulmonary physician and those who were fit for undergoing six minute walk test were screened and were enrolled in the study. Subjects underwent 4m gait speed as follows-

A flat unobstructed surface was identified for the test. 4 meter distance was marked with tape. Subjects were given standard instructions as, 'this is our walking course. I want you to walk to the other end of the course at your usual speed, just as if you were walking down the street to go to the shops[9]. Walk all the way past the other end of the tape before you stop. Ready…begin'. Subjects were positioned such that their toe will just touch the start line.Two examiners recorded the time of walking with stopwatch. Subjects underwent 4 meter gait speed test two times 24-48 hours apart with the same two examiners. Best reading out of them was recorded for analysis. Patients underwent 6 minute walk test one week after 4 meter gait speed test was done. 6MWT was performed according to ATS guidelines and standard instructions on a 30 meter hallway. Patients walking capacity was recorded. Patients who are on oxygen support performed both the tests with oxygen support.

RESULTS

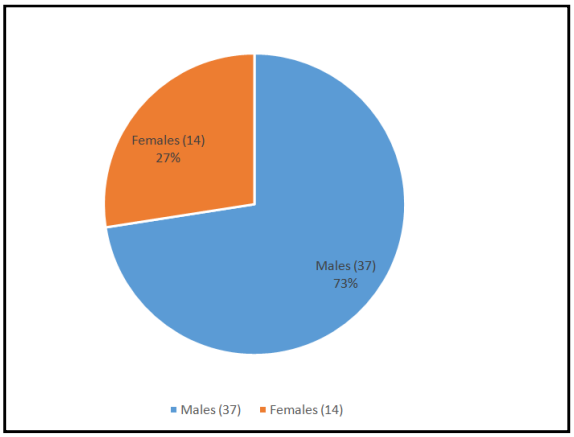
Age Distribution

50 COPD patients of moderate to severe disease were enrolled for the study after taking informed consent. Following chart demonstrates the age distribution of patients with average age being 63 years.



Genderwise Distribution

Out of 50 patients enrolled there were 13 females and 37 males.

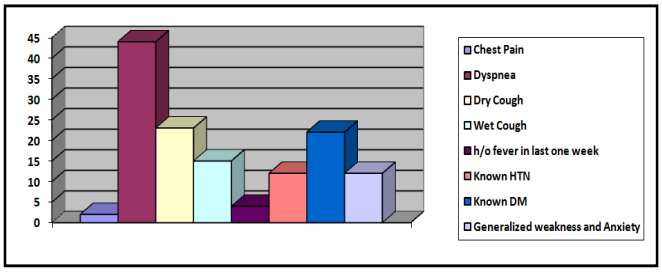


Symptoms and associated comorbidities

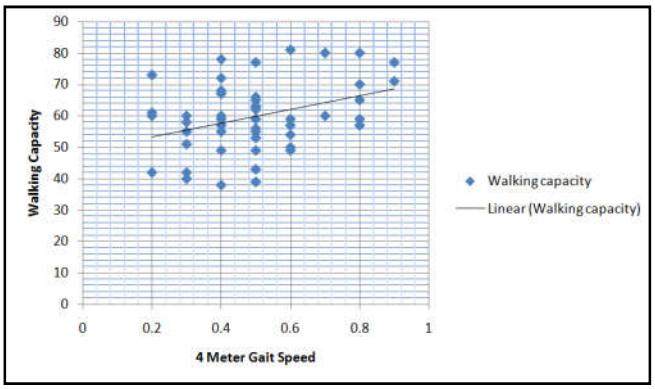
Patients enrolled were of different severity of symptoms and other comorbidities. 44 out of 50 patients had varying levels of dyspnea. Most of them were having dyspnea Grade II on MMRC scale. 23 patients had to take pause during 6 MWT because of dyspnea. Activities of daily living were affected for all 44 patients. 38 patients reported of having cough of various severities. Out of them 23 had dry cough and 15 reported wet cough. Wet cough was associated with diurnal variation for almost all patients having expectoration early in the morning.
4 patients gave history of fever in last one week whereas 12 reported generalized weakness and anxiety. There were 12

patients who were known hypertensive and 22 were known diabetic.

Chest Pain	2
Dyspnea	44
Dry Cough	23
Wet Cough	15
h/o fever in last one week	4
Known HTN	12
Known DM	22
Generalized weakness and Anxiety	12



Correlation between Walking Capacity and 4 meter gait speed



As the scatter diagram represents there is weak positive correlation between 4 meter gait speed and 6 MWD with the correlation coefficient being r= 0.357

DISCUSSION

A COPD patient is usually in a vicious cycle of deconditioning, dyspnea and decreased exercise tolerance. In pulmonary rehabilitation, we try to break this vicious cycle and improve the quality of life of the patient. In this course of rehabilitation 6 minute walk test is an important tool to assess patient's progress and response to treatment. In clinical scenario, many times it is not possible for the patient to perform 6MWT because of many reasons like, dyspnea, musculoskeletal impairments and anxiety. Physician and the therapist have to postpone the exercise testing session. In such cases usually therapist has to go for symptom limited exercise tolerance testing. But these symptom limited tests do not have any validity and reliability and also are very subjective. Thus, there should be a valid and reliable measure which can be used in such clinical scenario. As 4m gait speed test is a reliable and valid measure of exercise capacity and health status in COPD patients; here in the present study we tried to establish correlation between 6MWT and 4m gait speed test.

The standard instructions in a 6MWT say that the patient has to walk "as far as" possible and not "as fast as" possible. The patient usually walks in a speed that he is using for his routine activities. In COPD patients, the speed of walking is usually decreased as compared to the healthy counterparts because of peripheral muscle weakness and fear of having dyspnea. This decreased speed is responsible for decreased 6 minute walk distance. 4 meter gait speed of less than $0.8m/s^2$ is a significant risk factor for mortality and morbidity in COPD patients. In the present study moderate and severe COPD patients were selected and we found that there was weak positive correlation between these two. We enrolled 50 subjects in the study and they performed 6MWT and 4m gait speed test. Correlation between the two showed a weak positive correlation. Out of the 50 patients enrolled maximum were of moderate severity (33 patients). The affection of 4m gait speed is more in severe disease patients. This could be the probable reason of weak positive correlation. Here in the present study, many confounding factors were present. As patients were of different severity of various symptoms, walking speed and distance was affected by them.There were 22 known diabetic patients but diabetic neuropathy was not evaluated individually. Dyspnea, anxiety and generalized weakness, cough may have affected the 6 MWT performance.

Limitation and further scope

A multicenter study with large sample size is required to establish the appropriate correlation. There is no grading of affection in 4m gait speed test which can be compared to the walking capacity of the patient.

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