

COPD Assessment Test (CAT) Score as a Marker of Disease Severity in COPDDhananjayan K.¹, Ramalingam A.², Jacinth Preethi J³, Krishna T.V.⁴^{1,2,3}Associate Professor, Department of General Medicine, Government Stanley Medical College, Chennai⁴Assistant Professor, Department of General Medicine, Kalaingar Centenary Super Specialty Hospital, Guindy, Chennai

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Conflict of interest: Nil

Abstract:

Background: Chronic Obstructive Pulmonary Disease (COPD) is characterized by chronic persistent airflow obstruction due to chronic inflammation in the airways and lungs in response to noxious particles or gases. The evaluation of COPD involves spirometry, chest X ray, pulse oximetry and arterial blood gas analysis. Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines recommend the use of COPD Assessment Test (CAT) score for assessing the severity of the disease.

Aim: To ascertain the correlation between COPD Assessment Test (CAT) Scores and Spirometry in assessing the severity of airflow limitation in stable COPD patients and to assess the use of CAT Scores as a marker of severity of COPD in the absence of spirometry for appropriate management of patients.

Methodology: A Cross-Sectional Study was conducted on 100 stable COPD patients of age > 40 years attending outpatient Department of General Medicine in a Tertiary Care Hospital in Chennai from January 2024 to June 2024. After obtaining Institutional Ethical Committee approval and informed consent from participants, data was collected for CAT questionnaire and spirometry. The data was entered in Microsoft excel and analyzed using one way ANOVA and SPSS software version 28.0.

Conclusion: From this study we conclude that there is a correlation between CAT scores and severity of airflow limitation. Although CAT scores can't be used as diagnostic tool, it gives a good measure of the severity of COPD and health-related impairment in the patients.

Keywords: COPD, CAT score, Spirometry, Severity.

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Introduction

COPD is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation due to airway and/or alveolar abnormalities. The GOLD [1] gives the guidelines for the management of patients with obstructive airway diseases.

Environmental factors like tobacco smoke [2], indoor air pollution, cooking with biomass fuels in confined areas in developing countries, occupational exposures, such as coal dust, silica and cadmium and infections [3], host factors including gene related predisposition, alpha one antitrypsin deficiency [4] and airway hyper-reactivity are recognized and established risk factors for obstructive airway disease.

In advanced COPD, air trapping increases residual volume leading to lung hyperinflation. While hyperinflation compensates for airway resistance [5], it impairs rib movement thereby reducing its ability to generate pressure. The chest wall also resists further lung inflation, increasing the effort of

breathing. Dynamic hyperinflation, caused by reduced expiratory flow during rapid breathing, worsens with exertion, contributing to dyspnea. There is non-uniform ventilation and there is also ventilation-perfusion mismatch [6] characteristic of COPD. Ventilation-perfusion mismatch is mainly responsible for the hypoxemia that occurs in COPD.

Spirometry is done initially before any bronchodilation and repeated after administration of a bronchodilator like salbutamol inhalation to determine the presence of airflow limitation and assessment of partial or complete reversibility [7]. A hallmark characteristic of COPD is irreversible or only partially reversible airflow restriction with bronchodilators.

The postbronchodilator ratio of FEV1/FVC is the first step and it confirms the presence or absence of airflow limitation after which the postbronchodilator percent predicted value for

FEV1 is obtained which confirms the severity of airflow limitation.

COPD Severity Assessment:

COPD severity categories are based on respiratory symptoms based on the Modified Medical Research Council [8] dyspnea scale or using the COPD assessment test scores and annual frequency of COPD exacerbations.

COPD Assessment Test (CAT Score) [9]

The COPD Assessment Test (CAT) has been developed Paul W. Jones et al (10) and are very practical and time saving. GOLD Guidelines (2022) recommend CAT as one component in grading symptom burden and to categorize patients into one of four groups A-D and hence plan management. COPD Assessment Test (CAT) - is a test with eight questions which was designed in way that it could be conducted anywhere. The scores are calculated from zero to forty. It has very good correlation with the SGRQ (St. George's Respiratory Questionnaire). A CAT cut point of 10 should be used as the threshold for considering regular treatment, and has been extensively documented.

Aim and Objective

The aim of the study was to ascertain the correlation between COPD Assessment Test (CAT) Scores and Severity of airflow limitation in stable COPD patients attending the OPD as assessed by Spirometry testing and to ascertain whether the feasibility of administration of CAT Scores in rural and resource poor settings as a marker of severity of COPD where spirometry is not available and thus be used for appropriate management of these patients.

Materials and Methods

The study was done in a Department of General Medicine in a Tertiary Care Hospital. The study is a Descriptive Cross-sectional Study. Included in the study were 100 patients aged 40 years and older who were hospitalized with a diagnosis of COPD as diagnosed by GOLD Guidelines between January 2024 to June 2024 Patients with Bronchial

Asthma, Tuberculosis- (Pulmonary and extrapulmonary), Bronchiectasis, Ischemic Heart Disease, Malignancy, Covid19 infection past and present, ILD and acute exacerbation of COPD were not included in the study. The study received approval from the institutional Ethical Committee.

Methodology

After obtaining informed and written consent spirometry was done in all patients and FEV1, FVC and ratio of FEV1/FVC were measured. After 15minutes post administration of 200-400 microgram of salbutamol, spirometry was done again. Post bronchodilator FEV1, FVC and FEV1/FVC ratio were measured and GOLD staging done. The Standardized CAT questionnaire in the Tamil language was provided to all the patients and asked to score their symptoms according to the severity. The calculated CAT Score was compared with spirometry measurements.

Data Analysis

Data were analyzed in terms of as means \pm standard deviation. The correlation between the CAT score and GOLD classification was tested by one way ANOVA.

In order to evaluate the correlation between parametric variables, the Pearson's correlation coefficient was utilized. Data analysis was performed using SPSS version 28.0. software. $P < 0.05$ was considered statistically significant.

Observation and Results:

Of The 100 COPD patients were chosen for the study 94 were males and 6 were females. The mean age was 56.02 ± 11.027 . The minimum Age was 41 years and maximum age of 78. The CAT questionnaire was administered to the sample population and the scores were analyzed. The mean CAT score was 16.22 with a standard deviation of 9.017 with a minimum score of 3 and a maximum of 38. Further correlation between the GOLD staging which denoted the severity of airway limitation and the mean CAT Score in each stage was analyzed with one-way ANOVA which showed statistical significance with p value < 0.01 .

Table 1:

GOLD	Stage 1	Stage 2	Stage 3	Stage 4
Number	22	41	28	9
Mean CAT Score	6.86	12.29	24.43	31.44
Std Deviation	3.106	2.977	5.007	5.961

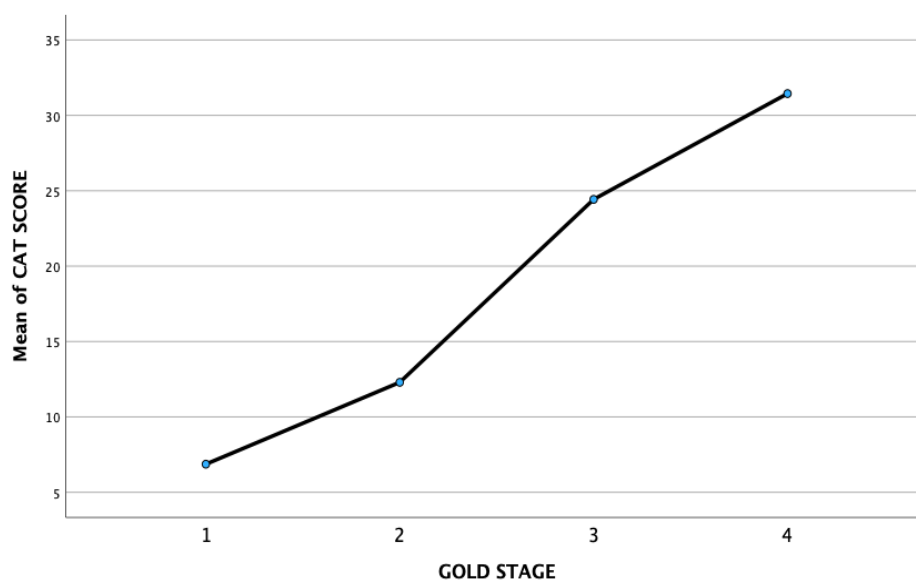


Figure 1:

Also, Pearson coefficient correlation was done which showed r value of 0.833 which was statistically significant with $p < 0.01$. Correlation of FEV1% predicted with CAT scores was also done with Pearson coefficient which was significant with r value of -0.908 and $p < 0.001$ indicative of a negative correlation. Mean FEV1/FVC ratio was 0.55760 with a standard deviation of 0.1039 with a minimum value of 0.324 and a maximum of 0.699

Discussion

COPD is a highly debilitating condition that significantly impacts not only the respiratory system but also the overall quality of life of affected individuals. The progressive nature of COPD leads to a decline in physical health, which often reduces the patient's ability to perform daily activities, work efficiently, and maintain income. This issue is particularly concerning in developing countries like India, where access to healthcare, especially in rural areas, is limited. Rural healthcare systems often lack the infrastructure, resources, and trained professionals needed to manage chronic diseases like COPD effectively. As a result, patients living in these settings may face a further diminished quality of life and experience more severe disease progression due to delayed or inadequate treatment.

The GOLD guidelines include assessing the patient's history of exacerbations, the severity of symptoms using tools like the Modified Medical Research Council dyspnoea scale, and the CAT score. Several studies have validated the CAT score as a reliable measure of health-related quality of life (HRQoL) in COPD patients. By quantifying symptoms such as breathlessness, cough, and sputum production, the CAT score provides insight into how COPD affects a patient's daily life and

overall well-being. From our study we were able to infer that the prevalence of COPD is significantly more in males than in females with more preponderance in the elderly population of age ≥ 60 . Our study sought to explore the relationship between CAT scores and the severity of airflow limitation as classified by the GOLD stages, which are determined using spirometry in accordance with the American Thoracic Society (ATS) guidelines. The results of our study showed a statistically significant correlation (p -value < 0.01) with a Pearson coefficient (r) of 0.833, indicating a strong relationship between increasing CAT scores and the worsening severity of COPD. This finding aligns with the results of previous research, including a study by Ghobadi et al [11], which also demonstrated a similar pattern.

As COPD progresses, patients typically experience an increase in CAT scores, reflecting the worsening of symptoms and a decline in their HRQoL. In particular, the inverse relationship between post-bronchodilator FEV1% predicted and CAT scores in our study highlights that as the severity of airflow obstruction increases, patients tend to report a higher symptom burden. This further emphasizes the impact of COPD on day-to-day functioning and reinforces the importance of early and adequate management to mitigate these effects. According to the study by Yelda Varol et al [12], higher baseline CAT scores have been linked to frequent exacerbations. Furthermore, our study underscores the clinical utility of the CAT score, especially in settings where spirometry, which is often unavailable in resource-limited areas, cannot be performed regularly. The CAT score can serve as a simple yet effective tool for monitoring the progression of COPD and adjusting treatment accordingly. This is

particularly important in rural and under-resourced healthcare systems, where spirometry may not be readily accessible. By using the CAT score, healthcare providers can still assess the impact of COPD on a patient's life and make informed treatment decisions that can improve both symptoms and overall quality of life.

Conclusion:

From this study we could conclude there is a correlation between CAT scores and severity of airflow limitation. Although CAT scores can't be used as diagnostic tool but in established COPD patients it does give a good measure of the severity of COPD as well as the health-related impairment in those patients. Therefore, it further helps to employ therapy according to the severity to reduce symptoms and exacerbations. Also, in rural settings which forms the major health care system in India where spirometry facilities may not be readily available, CAT questionnaire which is readily available in local dialect can be used as a tool to assess severity and guide management.

Limitations of the Study:

1. Sample size was small.
2. Females included in our studies were very less – 6% and therefore correlation cannot be extended to the female gender without further studies.

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