

Evaluation of CAT Score in a Cross-Sectional Study of Construction Site Workers with COPD

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Abstract

Pulmonary function tests (PFTs) are commonly utilised to gauge lung function and diagnose chronic obstructive pulmonary disease (COPD). The COPD Assessment Test (CAT) is a questionnaire utilized to evaluate COPD's impact on health status. This study aims to examine the relationship between PFT interpretation, COPD severity, and CAT scores. A retrospective analysis was conducted on PFT results and CAT scores of 200 construction site workers with COPD. PFTs were categorized into three severity levels: mild obstruction, moderate obstruction, and severe obstruction. CAT scores were classified as mild, moderate, or severe based on predefined thresholds. The distribution of PFT interpretation and CAT scores within each COPD severity level was calculated. Among the study population, 13% had mild obstruction, 54% had moderate obstruction, and 33% had severe obstruction based on PFT interpretation. In terms of CAT scores, all patients with mild PFT obstruction had mild CAT scores, while those with moderate PFT obstruction had moderate CAT scores (100%). Similarly, patients with severe PFT obstruction had severe CAT scores (100%). Overall, the distribution of CAT scores corresponded with the severity of PFT obstruction. These findings highlight the usefulness of combining PFT results with CAT scores for a comprehensive evaluation of COPD severity and its impact on patients' well-being. Incorporating both PFTs and CAT scores in clinical practice can aid in treatment decisions and monitoring the progression of COPD.

Keywords: Construction Site Workers, CAT-Score, Co-Morbidity, Pulmonary Function Test, Smoking History.

Introduction

COPD is a common respiratory disease that is manifested by the bronchial tree's constriction and reduced lung efficiency. It is mostly because of the inflammation of the airways which is chronic and mostly as a result of cigarette smoking [1]. This condition affects respiratory function and has other effects on the body that reduce the quality of life of patients [2].

Construction workers also have a high risk of acquiring respiratory diseases in the aspect of occupational health by dust, chemicals, and other pollutants. These hazardous exposures

can also worsen the existing respiratory diseases, and can also cause COPD [3]. In addition to this, construction workers are more likely to smoke, and smoking causes the development of COPD and the worsening of severe forms of the disease [4]. Occupational exposures and smoking are synergistic; thus, this population is at a higher risk of contracting respiratory diseases.

To assess the effect of COPD on the health status and quality of life different tools are applied. Of these, the COPD Assessment Test (CAT) is one of the most used questionnaires and it is recommended for use in clinical practice. It is a measure with eight questions to

evaluate various aspects of COPD and how they interfere with the patient's life [5]. The CAT offers a structure for the assessment of the symptoms' intensity and changes in it. However, its effectiveness and applicability in certain population categories, for instance, construction workers who smoke and have other health issues, has not been researched [6].

Another test that is used in the diagnosis of COPD is the Pulmonary Function Test (PFT). These tests define the lung volumes and the restriction of the airflow with a high degree of accuracy that is useful in COPD diagnosis and its severity [7]. Therefore, the integration of CAT results with PFT data may assist in achieving a better understanding of the effects of the disease, including in the aforementioned vulnerable population, namely construction workers.

But it is also relevant to think about the general conclusions that can be made based on this research. In the following studies, it has been established that several workplace agents like dust and fumes play a role in the development and advancement of COPD [8]. These are some of the risks that need to be taken into consideration in the management and prevention of COPD in construction workers. COPD is associated with smoking and any other work-related exposure that a person is exposed to will only aggravate the condition [9]. This interaction shows that there is a requirement to apply the individual approach to the prevention of occupational threats and smoking [10]. Some drawbacks in the previous research should be recognized while constructing the COPD management strategies, for example, the authors have not always transferred the assessment tools to some patients [11]. Thus, the purpose of this study is to increase the understanding of the CAT questionnaire and its relationship with PFT to improve the management approaches and interventions. It is believed that these findings will enhance the quality of life of

COPD patients in construction sites by enhancing their understanding of the disease and the instruments that should be employed for its evaluation and management [12]. The purpose of this research is to assess the validity and reliability of the CAT questionnaire in identifying the symptoms of COPD among construction site workers who are smokers and have other diseases. The purpose of this assessment is to establish the suitability of the CAT in assessing COPD characteristics among this particular group of patients. Further, the study will also compare the CAT results with the PFT data to check the applicability of these tools in this regard.

Materials and Methods

Study Design

This research employed a descriptive analysis design to determine the demographic and clinical profile of patients diagnosed with COPD who are smokers and have co-morbid conditions. The target was for construction site workers to appreciate the effects of occupational risks on COPD. This study has been approved by the Institutional Human Ethical Committee (Ref. No.002/SBMC/IHEC/2022/1693).

Participants

The participants of the study were 200 construction site workers, who had COPD, a documented diagnosis of the disease, a smoking history, and other illnesses. To protect participants' identification, their records were pseudonymized. Variables included were age, smoking history, CAT scores, and results of pulmonary function tests. The study period was five months (January 2024-May 2024).

Study Population

The target population included two hundred construction site workers with unstable cardiovascular conditions, active pulmonary tuberculosis, and lung cancer. Patients who refused spirometry or CAT testing or those

who could not undergo spirometry, those who have chest wall deformities, and those who have undergone recent eye & abdominal surgery, and recent myocardial infarction were excluded from this study. This selection process made it possible to include only patients with COPD in the high-risk occupational group without interference from other severe health conditions.

COPD Assessment Test (CAT)

The COPD Assessment Test (CAT) questionnaire was administered to each participant individually. The CAT questionnaire consists of eight items related to COPD symptoms and their impact on daily life. Participants were required to respond to each item on a scale from 0 to 5, with higher scores indicating more severe COPD symptoms.

Spirometry (Pulmonary Function Test - PFT)

The spirometry tests were carried out by the recommendations of the European Respiratory Society (ERS). A computer-based spirometer (KOKO spirometry) was used for the testing. All tests were conducted using the same spirometer by the same examiner. Each subject was instructed to take a deep breath, hold it for at least 6 seconds, and then exhale as forcefully and rapidly as possible for at least 6 seconds more. The same procedure was repeated three times for each participant and the best among them was taken into consideration. To minimize air loss and the transmission of infection, nose clamps were employed in conjunction with a disposable turbine to maintain a sterile environment. Before blowing into the turbine, participants were instructed to clamp their lips together and their noses were tightly sealed by nose clips. Three separate attempts at the exam were made, with the average results being recorded.

Statistical Analysis

Cross-tabulation: The cross-tabulation table was generated to analyze the relationship between CAT score severity and PFT interpretation. It presents the distribution of participants across different combinations of CAT score severity (MILD, MODERATE, and SEVERE) and PFT interpretation (MILD OBSTRUCTION, MODERATE OBSTRUCTION, and SEVERE OBSTRUCTION).

1. Count and Percentage Calculation: The count of participants falling into each combination of CAT score severity and PFT interpretation categories was determined based on the data collected. Additionally, the percentage distribution within each category was calculated to understand the relative proportions.
2. Data Interpretation: The cross-tabulation table allows for the assessment of how CAT score severity relates to the degree of airway obstruction observed in the spirometry results. It indicates the number and percentage of participants with different combinations of CAT scores and PFT interpretations.
3. Statistical Significance: Further statistical tests, such as chi-square tests or Fisher's exact tests, were conducted to determine if there is a significant association between CAT score severity and PFT interpretation.
4. Co-relation Analysis: This study examines the correlation between CAT Score usage and COPD in construction workers. Statistical analysis suggests a significant relationship, indicating potential benefits for COPD management.

Results

The study involved a total of two hundred patients with COPD, all the patients had a history of smoking and co-morbidity. The participants' age was 61. 23 years and the age distribution varied from 27 to 80 years. The pack years of smoking, calculated as the products of the number of packs smoked per

day and the number of years smoked, was found to be 20. 13. This measure gives the total amount of smoking exposure that the participants have been subjected to in their lifetime. Also, the mean score on the COPD Assessment Test (CAT) that measures the effect of COPD symptoms on the patient's quality of life was 17. 37. This score indicates that the patient's quality of life is relatively affected by COPD-related symptoms. The Forced Expiratory Volume in one second (FEV1%) was recorded to be between 12. 00% and 75. 00% with a mean of 47. 225% thus showing that the participants had different levels of lung function impairment.

Frequencies

Concerning the demographic characteristics of the sample, all the participants were males, and this constituted the total study population of the sample of 200. Concerning COPD diagnosis, 158 of the participants (79. 0%) had a confirmed diagnosis of COPD; 42 participants (21. 0%) had AE COPD. This distinction points to the fact that some of the participants experience more serious episodes. Regarding the smoking status 41(20. 5%) of the participants were found to be current smokers, 136(68. 0%) were ex-smokers, and 23 (11. 5%) were non-smokers. This distribution of smoking status indicates that there is a difference in the level of smoking-related damage within the study population [13].

Correlation Studies

In the correlation analysis that was performed, the objective was to determine the relationship between the obtained CAT scores and the FEV1% value. The results are

summarized in Table 1 where Spearman's rho, a non-parametric measure of correlation was used. The analysis provided a correlation coefficient of - 0. 746 for CAT scores with FEV1%. This coefficient indicates a very high negative relationship between the two variables. In particular, as the overall CAT score rises, meaning that the patient's symptoms of COPD affect his/her life more significantly, the FEV1% decreases, which points to the worsening of lung function. On the other hand, the results of lower CAT are positively correlated with the FEV1% indicating better lung function. The coefficient value is 0. 252, and the p-value is equal to 0. 01, which indicates that the probability of obtaining such a relationship by chance is very low.

It is important to note that the correlation coefficient is always symmetric, that is, the degree of the relationship between CAT scores and FEV1% is the same regardless of which variable is considered independent and which one is considered dependent. This shows that the relationship between these variables is balanced and similar. The negative coefficient obtained, and the high level of significance imply that CAT scores of COPD patients are inversely related to FEV1% and that, as the severity of COPD symptoms increases, lung function decreases. These results therefore support the use of both CAT scores and FEV1% in the evaluation and management of COPD patients. They offer valuable information on the course of the disease and the efficacy of the applied treatments. Clinicians should incorporate these metrics into their assessment procedures to enhance treatments and patient outcomes.

Table 1. Representation of Correlation Studies of Construction Workers With Symptoms

			CAT SCORE	FEV1%
Spearman's rho	CAT SCORE	Correlation Coefficient	1.000	-.746**
		Sig. (2-tailed)		.000
		N	200	200
	FEV1%	Correlation Coefficient	-.746**	1.000
		Sig. (2-tailed)	.000	
		N	200	200
**. Correlation is significant at the 0.01 level (2-tailed).				

Interpretation

According to the PFT interpretation, 26 participants (13.0%) had mild obstruction, 108

participants (54.0%) had moderate obstruction, and 66 participants (33.0%) had severe obstruction (Table 2).

Table 2. PFT Interpretation of COPD Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MILD OBSTRUCTION	26	13.0	13.0	13.0
	MODERATE OBSTRUCTION	108	54.0	54.0	67.0
	SEVERE OBSTRUCTION	66	33.0	33.0	100.0
	Total	200	100.0	100.0	

Discussion

The descriptive statistics provide an overview of the demographic characteristics and also clinical profiles of construction workers with COPD symptoms. The high percentage of male participants reflects the higher prevalence of COPD among men. The distribution of participants across different severity levels based on CAT scores and PFT interpretation indicates the varying degrees of COPD symptom burden and lung-function impairment within the sample. The correlations indicate a significant association between CAT scores and both pack years of

smoking and lung function (FEV1%) [14]. The positive correlation between CAT scores and pack years suggests that smoking history contributes to the severity of COPD symptoms reported by the patients. The negative correlation between CAT scores and FEV1% (Table 1) highlights the relationship between subjective symptom assessment and objective measures of lung function, indicating that higher CAT scores are associated with more pronounced airflow limitation [15].

These findings are consistent with previous studies that have shown the impact of smoking history on COPD severity and the relationship

between subjective symptom assessment and objective measures of lung function [16]. The results emphasize the importance of considering both subjective and objective measures in the evaluation and management of COPD patients with a history of smoking and co-morbidity [17]. It is important to note that these findings are based on a specific sample of COPD patients with a history of smoking and co-morbidity. Further research with a larger and more diverse sample is necessary to generalize the findings and explore the impact of different co-morbidities on COPD symptom burden and lung function impairment [18].

Overall, this study provides valuable insights into the relationship between subjective symptom assessment, smoking history, and objective measurements of lung function in COPD patients with a history of smoking and co-morbidity [10]. These findings contribute to the existing knowledge and can guide healthcare professionals in developing tailored treatment approaches and interventions for this specific patient population [19].

In conclusion, the crosstabulation table and statistical analysis demonstrate a robust association between CAT score severity and PFT interpretation in construction site workers with COPD [20]. Higher CAT scores were significantly linked to greater airway obstruction in spirometry results, highlighting the CAT questionnaire's value in assessing COPD severity and its correlation with lung function impairment. These insights provide valuable guidance for tailored interventions and improved quality of life in this population [21], but further research is needed to explore CAT scores' predictive value in disease progression and treatment outcomes, while also considering potential confounding factors for enhanced validity and generalizability [22].

Conclusion

The COPD Assessment Test (CAT) questionnaire and pulmonary function tests

(PFTs) are useful for diagnosing and forecasting construction workers with COPD and smoking history and co-morbidity. Therefore, it is recommended that these instruments be used to measure the extent and severity of COPD in the patient and the effect on the patient's quality of life. The CAT questionnaire helps in determining the impact of COPD symptoms on the patient's quality of life and is a self-completed tool that is patient-centred. This is a very subjective measure, but it is very useful when considering the symptoms of the patient's functional capacity and quality of life.

On the other hand, pulmonary function tests provide the actual picture of lung function and explain the extent of physiological dysfunction in numbers. The FEV1% obtained from the PFTs gives factual data regarding the extent of lung impairment and is critical to determining COPD severity. The use of the CAT questionnaire is beneficial in the sense that it gives the clinician the patients' perception of their symptoms in addition to the PFT results thus providing a holistic view of the patient. This dual approach improves the capacity to determine the stage of a disease, the kind of treatment to give, and the likely progression of the disease in the future.

The results of CAT scores and PFT are useful in providing an overall assessment of COPD patients. This integrated assessment is most appropriate for construction workers because they are prone to the development or worsening of COPD due to environmental and occupational factors. Due to the special working conditions and the presence of other chronic diseases, it is possible to have a proper assessment and develop appropriate working and health-related preventive and therapeutic measures.

Future Scope

Future studies should seek to do the same with a larger, more diverse sample of COPD patients. The study should be continued with

patients with different stages of the disease and patients from other occupations to get a broader picture of COPD and its impact. Besides, it is possible to turn to other approaches in the assessment of the disease, for instance, more sophisticated imaging and biomarkers. These improvements may also help in the enhancement of the diagnosis of COPD, the specificity of the treatment, and the quality of care for patients with COPD.

Future research has to be carried out to increase the understanding of COPD assessment and management. Therefore, the researchers can help create better interventions by investigating numerous diagnostic and prognostic approaches, traditional and innovative. These are required to improve the quality of life of the patients and to address the

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complex factors that are related to COPD. Therefore, the further development of the assessment of COPD remains an important and promising area for future research.

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Conflict of Interest

The author declares that there is no conflict of interest in this study.

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