

## THE RELATIONSHIP BETWEEN LUNG FUNCTION, DISEASE SEVERITY, AND MOTIVATION TO QUIT SMOKING AMONG CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) PATIENTS

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### ABSTRACT

**Background:** Smoking cessation is an important management for Chronic Obstructive Pulmonary Disease (COPD), but many patients continue to smoke due to low motivation. Therefore, further studies exploring the motivation to quit smoking are needed. This study examines the relationship between lung function, disease severity, and motivation to quit in COPD patients.

**Methods:** A correlational cross-sectional study was conducted at a pulmonary hospital in Yogyakarta, Indonesia, in February 2024. One hundred adults with COPD who were current smokers were chosen through random sampling. We used the Richmond Test to measure motivation to quit smoking, the COPD Assessment Test (CAT) questionnaire to assess the severity of COPD, and Peak flow meters to assess lung function by measuring peak expiratory flow (PEF). Descriptive statistics were provided to summarise the characteristics of the participants, and Spearman's rank correlation was used to analyse the relationships between the variables.

**Results:** The average age of the participants was 65 years, the length of time they had been smoking was 23 years, and the number of cigarettes smoked each day was 23. Most respondents showed moderate motivation to quit smoking (70%) and had a diagnosis of severe (60%) COPD. There is a significant correlation between peak expiratory flow and the motivation to quit smoking ( $p = 0.03$ ) and between the severity of the disease and the motivation to quit smoking ( $p = 0.04$ ).

**Conclusion:** These findings emphasise the importance of communicating PEF assessment results and disease severity to enhance COPD patients' motivation to quit smoking.

**Keywords:** COPD, factor, motivation, smoking cessation

### INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality around the world. It is caused by problems with the airways and alveoli that cause persistent respiratory symptoms and limit airflow (Baha et al., 2023). The World Health Organisation (WHO) says that about 391.9 million adults between the ages of 30 and 79 have COPD. In 2019, the disease was present in 10.3% of the population. Around 3.23 million people died from COPD in 2019, which is 6% of all deaths worldwide. It is expected to become the third leading cause of death in the world (WHO, 2024). The

Ministry of Health (Kementerian Kesehatan RI) in Indonesia says that 5.6% of adults over 30 have COPD, a big public health problem in the country (Kemenkes RI, 2019).

Smoking cigarettes is still the biggest risk factor for getting COPD and making it worse. About 80–90% of diagnosed cases are linked to a history of smoking (Wu et al., 2024). Not only does smoking raise the risk of getting sick, it also makes lung function worse, makes symptoms worse, and makes acute exacerbations and hospitalisation more likely. (Agusti et al., 2023). Although COPD management guidelines and good clinical evidence suggest that smoking cessation is the best way to reverse the progression of COPD, many patients continue to smoke after being diagnosed. A study of 1,740 men with COPD in Korea found that 1,210 (69.5%) of them kept smoking after being diagnosed, while only 530 (30.5%) succeeded in trying to quit (Doo et al., 2023). Smoking remains highly prevalent in many countries, including Indonesia, where more than 34.5% of adults (approximately 70 million people) still smoke, with 65.5% of these being men and 3.3% being women. (WHO et al., 2022). This continued tobacco use highlights the complexity of nicotine addiction and the challenges associated with promoting smoking cessation in this vulnerable population.

Motivation to quit smoking is very important for COPD patients who want to stop smoking. But many things can affect motivation, such as how ready someone is mentally, what they think are the benefits and barriers, support from healthcare professionals, and clinical signs of how bad the disease is (Eklund et al., 2012; Zhang et al., 2022). Peak Expiratory Flow (PEF) is a common test for lung function that can show how much airflow is limited and how the disease is getting worse. People with lower PEF values usually have worse symptoms, like shortness of breath and a lower tolerance for physical activity, which can make them more aware of how bad their health is getting (Kakavas et al., 2021; Pothirat et al., 2015). The COPD Assessment Test (CAT) is a common way to measure how bad a disease is. It takes into account how often episodes happen and how much the disease affects daily life. Patients with more severe disease or worse lung function may feel more threatened by the harm that smoking can cause, which can make them more likely to want to quit. On the other hand, people with milder diseases might not realise how dangerous smoking is and not feel as much of a need to quit. Recent studies show that giving patients objective, personalised feedback on their health status, like how bad their disease is, can make them more aware of the negative effects of smoking and more likely to want to quit (Gupta et al., 2022).

This shows how important it is to use objective clinical results like PEF scores and CAT assessments in counselling to help patients understand how smoking can make their disease worse. Healthcare professionals can increase patients' perceived risk and readiness to change by giving them personalised information about their current lung function and the severity of their disease. Nurses are uniquely positioned to deliver patient-centred education and counselling for smoking cessation as part of a comprehensive Nursing Intervention for COPD management. The study found that nurses had six important functions in smoking cessation programs: assessors, educators, practice facilitators, coordinating collaborators, organisers, and supervisors (Jiang et al., 2024a). However, there has been limited research on factors associated with smoking cessation motivation in COPD patients in Indonesia. This knowledge gap limits the ability to design tailored and effective interventions to meet the unique needs of this population. Therefore, this study aims to examine the relationship between peak expiratory flow, disease severity, and smoking cessation motivation in COPD patients. Understanding this relationship may aid in the development of evidence-based nursing interventions and more effective educational strategies to promote smoking cessation in this high-risk group.

## RESEARCH METHOD

This study used a correlational cross-sectional design and was conducted in February 2024 at a pulmonary hospital in Yogyakarta, Indonesia. The population being studied was adult COPD patients who were current smokers. The number of samples in this study was one hundred respondents selected by simple random sampling with the inclusion criteria that participants must be adults who have been diagnosed with COPD, are currently smoking, and are willing to provide informed consent. The exclusion criteria for this study were patients diagnosed with respiratory illnesses other than COPD.

Research data collection was conducted through direct interviews and clinical measurements during routine clinic visits. Data collection for the research was carried out via direct interviews and clinical measures during standard clinic appointments, each lasting around 20 minutes. The researcher used a peak flow meter to measure the Peak Expiratory Flow (PEF) three times, calculating the average PEF value. Following that, interviews were conducted to evaluate illness severity using the CAT instrument and to assess smoking quitting motivation employing the Richmond Test instrument.

The research instruments used were the Richmond Test to measure motivation to quit smoking, the COPD Assessment Test (CAT) questionnaire to assess the severity of COPD, and a peak flow meter to measure PEF. The Richmond Test, a four-item questionnaire with proven validity, was used to measure the desire to quit smoking. Scores were divided into three groups: high (8-10), moderate (6-7), and low (0-5). The peak flow. The severity of COPD was assessed using the validated and reliable COPD Assessment Test (CAT) questionnaire. There are eight questions on the CAT, and each one gets a score from 0 to 5 points. The overall score can be anywhere from 0 to 40 points. A score of 0-10 means mild COPD, 11-20 means moderate COPD, 21-30 means severe COPD, and 31-40 means very severe COPD. Previous studies have assessed both instruments for validity and reliability and found them to be valid and reliable. (Brunault et al., 2024; Jones et al., 2009; Pothirat et al., 2014; RICHMOND et al., 1993). This means that they can be used. A structured questionnaire was used to get more information, such as the person's age, how long they had been smoking, how long it had been since they were diagnosed with COPD, and how many cigarettes they smoked each day.

We used descriptive statistics to give a summary of the characteristics of the participants and the distributions of the variables. We explored the correlations between peak expiratory flow, disease severity, and the motivation to quit smoking using Spearman's rank correlation, with a p-value of less than 0.05 being considered statistically significant. The Spearman test was employed to examine the correlation among smoking quitting motivation, PEF values, and disease severity due to the non-normal distribution of the numerical data. This research has been approved by the Ethics Committee of the Yogyakarta Respira Lung Hospital with approval number 015/KEPK/I/2024 Yogyakarta Respira Lung Hospital, and all participants signed a form stating they understood what was going on before any data was collected.

## RESULTS

Table 1 shows the characteristics of the COPD patients who took part in this study. The average age of the people who took part was 65 years (SD = 10.62), with ages ranging from 40 to 85. The average length of time people smoked was 23 years (SD = 6.94), with a range of 4 to 50 years. The average time since being diagnosed with COPD was 7 years (SD = 3.98), with a range of 3 to 15 years. The average number of cigarettes smoked each day was 23 (SD = 7.59), with a range of 20 to 60 cigarettes.

Table 1. Respondent characteristics of COPD Patients (n=100)

| Variable                           | Mean $\pm$ SD  | Minimum | Maximum |
|------------------------------------|----------------|---------|---------|
| Age (years)                        | 65 $\pm$ 10.62 | 40      | 85      |
| Duration of smoking (years)        | 23 $\pm$ 6.94  | 4       | 50      |
| Duration of COPD diagnosis (years) | 7 $\pm$ 3.98   | 3       | 15      |
| Number of cigarettes per day       | 23             | 20      | 60      |

Table 2 shows the severity of COPD and how many people with it want to quit smoking. None of the patients were classified as having mild or moderate COPD. About 60% of the patients were categorised as having severe COPD, and 40% were in the extremely severe stage. This distribution shows that more advanced stages of COPD were more common among the participants, which means that a lot of the people in this study were having serious problems. Table 2 also shows that most COPD patients (70%) had a moderate level of motivation to quit smoking. This study shows that COPD patients require more specific treatment to convince them to quit smoking, especially since this group is in the later stages of the disease.

Table 2. The Severity Level of COPD and Motivation to Quit Smoking among COPD Patients (n=100)

| Variable                            | Frequency | Percentage (%) |
|-------------------------------------|-----------|----------------|
| The Severity Level of COPD          |           |                |
| Mild                                | 0         | 0              |
| Moderate                            | 0         | 0              |
| Severe                              | 60        | 60             |
| Very Severe                         | 40        | 40             |
| Level of Motivation to Quit Smoking |           |                |
| Low Motivation                      | 0         | 38             |
| Moderate Motivation                 | 70        | 70             |
| High Motivation                     | 30        | 30             |

Table 3 shows the relationship between peak expiratory flow (PEF) and disease severity, with the motivation for smoking cessation among COPD patients. The average motivation score to quit smoking was 7 (SD = 1.07), with scores between 6 and 10. The average PEF value was 148 L/min (SD = 53.7), with a low of 60 L/min and a high of 260 L/min. The average illness severity score (CAT) was 28 (SD = 4.53), with scores going from 21 to 40.

Table 3. The Correlation of Peak Expiratory Flow and Disease Severity with Motivation to Quit Smoking among COPD Patients

| Variable                   | Mean | Minimum | Maximum | Standar Deviasi | r       | P-Value |
|----------------------------|------|---------|---------|-----------------|---------|---------|
| Motivation to quit smoking | 7    | 6       | 10      | 1.07            | - 0.298 | 0.03    |
| Peak expiratory flow       | 148  | 60      | 260     | 53.7            |         |         |
| Motivation to quit smoking | 7    | 6       | 10      | 1.07            | 0.204   | 0.04    |
| COPD disease severity      | 28   | 21      | 40      | 4.53            |         |         |

The Spearman correlation analysis showed a significant negative association between PEF and the motivation to quit smoking ( $r = -0.298$ ,  $p = 0.03$ ). This indicates that lowered PEF values correlated with a higher desire to quit smoking. There was also a strong positive link between how bad the disease was and how motivated people were to quit smoking ( $r$

= 0.204,  $p = 0.04$ ). This means that those with worse diseases were more likely to want to quit smoking

## DISCUSSION

The study found a correlation between peak expiratory flow (PEF), severity of COPD, and the motivation to quit smoking. This means that both lung function and the progression of the disease are strongly correlated to a person's motivation to quit smoking. These results support the Health Belief Model (HBM), which states that people are more likely to do things that are good for their health, like quitting smoking, when they think their health risks are very high and critical. The health belief model is a psychological model that tries to explain and predict health behaviours by looking at what people think and feel. The degree of perceived risk of getting an illness is one of the most important parts of the health belief model. This variable comprises how likely someone believes they are to get a health problem and how bad they believe it will be once they do (Kagee & Freeman, 2025). The significant relationship shown in this study shows that people with worse lung function and more severe disease are more likely to want to quit smoking because they know how bad smoking is for their health. This agrees with other research that says how bad the sickness is can affect how much someone wants to quit smoking (Pribadi & Devy, 2020). Other studies have found that people who want to quit smoking in the next 30 days are more likely to have a cough, phlegm, wheeze, or shortness of breath (Melzer et al., 2016).

The individuals had an adequate amount of motivation, with an average score of 7 and a standard deviation of 1.07. This level of motivation is typical of many COPD patients who know smoking is poor for their health, but may not have the help or resources they need to quit. This is in line with what other studies have found: people with chronic diseases like COPD often know they need to quit smoking, but they may not be able to do so because they don't feel like they can, they are mentally stressed, or they don't get immediate relief from their symptoms. A study by Lindberg et al. said that those with COPD who smoked had greater pack-years and breathing problems than people who didn't smoke. But both groups had greater nicotine dependence scores, which were linked to anxiety and despair. The study found that quitting smoking was strongly linked to reduced nicotine dependence and high self-efficacy, even when the person had COPD, respiratory symptoms, anxiety, depression, or heart problems (Lindberg et al., 2015).

The average PEF value in this study was 148, with a range from 60 to 260. This shows that the patients' lung function varied a lot. Lower PEF values usually mean that the airflow restriction is worse, which means that the COPD is more advanced. This finding is in line with the fact that patients with severe lung disease are more likely to want to stop smoking. One study indicated that having a severe disease made people far more likely to want to quit smoking (OR = 3.7) (Bouaïti et al., 2010). Another study found that smokers with impaired lung function were more motivated and used more resources to quit (McClure et al., 2010). Patients with poor lung function are more likely to have worse symptoms and attacks, which may make them think about quitting smoking to get better. The results also show that lung function getting worse may be a reason to quit smoking, since people with severe airflow problems are likely to realise how important it is to quit to save their lungs from getting worse.

The COPD Assessment Test (CAT) was used to find out how bad the COPD was. The average score was 28. This means that most of the people who took part had severe COPD, and a lot of them also have very severe COPD. The CAT score, which has a standard deviation of 4.53, shows how different the severity of COPD is in this group. There is a clear correlation between how severe the disease is, how well the lungs work, and how motivated someone is to quit smoking. As a person's COPD gets worse, they are more



likely to have symptoms that make it hard to breathe and cough all the time. These symptoms can make them want to quit smoking more to feel better and stop the disease from getting worse. Furthermore, another study showed that complaints of shortness of breath in COPD patients due to limited airflow made smokers with COPD want to quit. The study also said that the diagnosis was a trigger, but that other things, such as psychological support and behavioural interventions, also played a role in the person's ability to quit smoking for good. This shows the complexity of quitting smoking for people with COPD. These results highlight the importance of incorporating physical and psychological health assessments into smoking cessation counselling for COPD patients (Fan et al., 2024; Houben-Wilke et al., 2018).

The results of this study showed a variety of patient conditions, but all within the abnormal range. PEF values ranged from 60 to 260, and CAT scores ranged from 21 to 40. This indicates that subjects were at different stages of the disease, with varying levels of lung function and symptom severity. These differences highlight the importance of having a tailored program to help people quit smoking. These results have clear implications for nursing practice. Nurses can apply the PEF and CAT data to give patients individualised feedback that helps them understand how their health is right now and how stopping smoking could assist them in smoking cessation counselling. For instance, displaying patients their low PEF values and high CAT scores might make them feel more severe and vulnerable, which are two important parts of the HBM, and this can increase their motivation. Patients with severe or very severe COPD, indicated by low PEF and high CAT scores, require more support and specialised approaches to quitting, such as nicotine replacement therapy, behavioural counselling, and access to healthcare professionals who specialise in helping people quit (Jiang et al., 2024b).

A comprehensive review and meta-analysis found that smokers with COPD can quit smoking if they get both behavioural treatment and medication. The study found that smokers with COPD who get both high-intensity behavioural help and medicines are more than twice as likely to stop as those who only get behavioural support. The research could not, however, find strong evidence for favouring any specific type of behavioural or drug treatment (van Eerd et al., 2016). Research by the Centres for Disease Control and Prevention (CDC) also shows how healthcare professionals can help people quit smoking. Nurses might want to consider giving patients motivational counselling, which could include multimedia lessons about how smoking affects health, to help them be more ready to quit. The CDC says that healthcare providers may help people quit smoking by not just encouraging them to do so, but also by giving them tools and sending them to specialised programs (Devonish et al., 2022). One effort to increase motivation to quit smoking is by providing counselling using videos on the impact of smoking on active smokers, passive smokers, and their families (Sutrisno et al., 2024).

## CONCLUSION

This study finds a significant correlation between motivation to quit smoking, lung function (PEF), and the severity of COPD (CAT). With an average score of 7 for smoking cessation motivation, the individuals were moderately motivated. The average CAT score for the individuals was 28, which means that most of them were in the severe to very severe stages of COPD. The subjects had different levels of lung function, with an average PEF of 148. The Health Belief Model says that the way people think about how likely they are to get sick and how bad it will be can make them more likely to do things that are good for their health, such as stopping smoking. Because of this, people with lung problems and more serious diseases are more likely to see how bad smoking is for them and want to quit.

## RECOMMENDATIONS

The study's findings suggest that COPD patients should be told about their clinical exam results, like their PEF values and the severity of their disease, during smoking cessation counselling. This will help them understand their health better and give them more motivation to quit smoking. We should keep this study going by getting more people to take part and adding more variables to look at what makes people want to quit smoking. We should also do other studies that can help people who want to quit smoking.

The primary strength of this study lies in the utilisation of objective clinical measurements (PEF and CAT) in conjunction with proven instruments for evaluating smoking cessation motivation (Richmond Test), thereby enhancing the trustworthiness of the findings. Nonetheless, this study possesses several limitations. First, the cross-sectional design inhibits the establishment of causal links among lung function, disease severity, and the motivation to cease smoking. Second, the study took place at a single pulmonary hospital with a rather limited sample size, which may restrict the applicability of the findings to larger groups. Third, additional psychosocial variables (e.g., self-efficacy, depression, and social support) that may affect motivation were not thoroughly examined.

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