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Factors Affecting the Quality of Sleep in Patients with Chronic Obstructive Pulmonary Disease (COPD)

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A B S T R A C T

COPD is a chronic disease characterized by airflow limitation in the respiratory tract. Symptoms that appear in COPD sufferers cause decreased sleep quality. This study aims to determine the factors that affect sleep quality in COPD patients. In the cross-sectional study design, the participants were 100 COPD sufferers without co-morbidities. Intake of non-probability sampling participants using purposive sampling method, the population of participants with COPD is domiciled in the working area of the Ciptomulyo Health Center in Malang. Data analysis used multiple logistic regression to determine the dominant factors in the sleep quality of COPD patients. The shortness of breath variable after being controlled by the smoking and coughing variable is a factor that greatly influences the sleep quality of COPD patients (OR=14).

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is characterized by persistent breathing and restricted airflow due to alveolar or respiratory tract abnormalities, other than that due to exposure to hazardous gases that can be treated or prevented (Agustí, A. Beasley, R. Celli, 2019). COPD is characterized by limited airflow in the respiratory tract. COPD can cause disturbances in oxygenation throughout the body due to alveolar damage and changes in respiratory physiology. Damage and changes in the lungs cause inflammation of the bronchi and cause damage to the walls of the terminal bronchioles and cause obstruction or premature closure of the expiratory phase resulting in the narrowing of the airways (Qamila et al., 2019). COPD symptoms such as coughing and dyspnea cause sleep disturbances, increasing the risk of COPD exacerbations. Sleep disturbances have an important impact on the quality of life of COPD sufferers (Shah et al., 2020).

he condition of shortness of breath during sleep causes the reticular activation system (SAR) to rise and release catecholamines such as noradrenaline which causes the sufferer to wake up.COPD can also result in difficulty initiating and maintaining sleep, cognitive changes, changes in immune function, and lead to acute COPD exacerbations (Kim et al., 2020). COPD patients, in general, experience insomnia, hypoventilation, and hypoxemia (Budhiraja et al., 2015a). Sleep is very important and needed in human life; good sleep lasts about 7-8 hours. Adequate and restful sleep is essential for well-being because, during sleep, the body and brain undergo the necessary restorative activities (Schindel et al., 2021).

The presence of shortness of breath in COPD patients, especially during sleep, causes the reticular activity system (SAR) to increase and release catecholamines such as norepinephrine, which causes individuals to wake up and is difficult to start sleeping again, resulting in shorter sleep quantity (Yatun et al., 2016). Anxiety can exacerbate insomnia (Budhiraja et al., 2015b). In addition, anxiety, loss of control over independence, changes in self-concept, and breathing difficulties result in serious psychological changes, including fear of death and depression (Tsai, 2017). Sleep disorders in COPD patients can increase the risk of COPD exacerbations, neurocognitive dysfunction, and decreased activity (Marques et al., 2021).

Data from survey results from Ciptomulyo Health Center (PKM) in 2021 showed 300 patients visited COPD diagnoses. Most complain of coughing up phlegm, shortness of breath, and difficulty sleeping well. In addition, the interview results found that the number of hours they slept was only short because they often woke up when they felt shortness of breath and coughing. Sleep is one of the important and basic needs of human life, and decreased sleep quality will impact daily life activities. Changes in long sleep disturbances can cause a decrease in physical and mental health.

Patients with reduced sleep quality will experience a healing process. Changes in breathing, especially during sleep, cause a decrease in gas exchange, impacting reduced oxygen delivery, especially to the brain or other vital organs. The reduced amount of oxygen supply, especially during sleep, can increase the

severity of the condition and have a fatal impact on people with lung disease. The urgency of this study is to find out what factors affect sleep quality, especially in COPD patients at PKM Ciptomulyo-Malang, which impacts the patient's healing process. This study aimed to determine the most influential factors on the sleep quality of COPD sufferers (Shaha et al., 2017).

THEORETICAL REVIEWS

COPD Concept

COPD is a lung disease characterized by chronic obstruction of pulmonary airflow that can interfere with normal breathing and is not fully reversible. COPD is not just a "smoker's cough" but an undiagnosed, life-threatening lung disease (WHO, 2019). Other risk factors that can cause COPD are air pollution, exposure at work, genetic factors, namely severe hereditary deficiency in alpha-1 antitrypsin, and older age and female sex increase the risk of COPD (Global Initiative for Chronic Obstructive Lung Disease, 2020). Increasing the degree of severity of COPD is also associated with death (Flynn et al., 2018).

Clinical manifestations of COPD patients are chronic and progressive shortness of breath and coughing with different sputum production daily (Windradini et al., 2020). Complications experienced by COPD sufferers experience hypoxemia due to the condition of decreased oxygen concentration in arterial blood. Hypoxemia can occur if oxygen is decreased in the air (hypoxia) or hypoventilation. Hypoxic events, atelectasis, and respiratory acidosis will occur due to increased PaCO2 (hypercapnia). Respiratory acidosis can also occur due to depression of the respiratory center, for example (due to anesthetic drugs, neurological disease) disorders or diseases affecting the muscles or chest wall, decreased area of gas exchange or perfusion ventilation, and airway obstruction (Kotaniemi et al., 2018). ymptoms include headache, fatigue, allergy, dizziness, and tachypnea.

The highest risk factor for COPD sufferers is smoking. Heavy smokers will experience excessive mucus secretion and chronic airway obstruction. It can stimulate excessive mucus production, and coughing, change the function of cilia, cause inflammation, and damage to the bronchioles and alveolar walls. Second-hand smoke can contribute to respiratory and COPD symptoms with increased lung damage from inhaling noxious particles and gases (Rumampuk & Talib, 2020).

Sleep Quality Concept

Quality sleep helps optimize the healing of diseases. Quality sleep will benefit the repair and healing of the body's systems. Sleep quality is a person's satisfaction with sleep so that a person does not show feelings of tiredness, anxiety, lethargy, apathy, blackness around the eyes, swollen eyelids, red conjunctiva, sore eyes, fragmented attention, headaches, frequent yawning or drowsiness (Gide, 2017). nadequate sleep with poor sleep quality can result in physiological and psychological balance disorders. Physiological impacts include decreased daily activities, feeling tired quickly, slowing the healing process, decreased immune system, and unstable vital signs. Psychological

impacts include depression, anxiety, and decreased cognitive function (Harahap, Afrida Sriyani, 2021).

Poor sleep quality in patients with COPD is caused by shortness of breath, coughing, and excessive secretion production. A person who has good sleep quality will affect his cognitive function (Budiman et al., 2021). Psychological stress, such as anxiety and depression, will usually cause disturbances in sleep frequency. Psychologies disturbed in etiology increase blood norepinephrine through the sympathetic nervous system. This substance will reduce stage IV NREM and REM (Shah et al., 2019).

Factors that cause poor sleep quality in COPD patients due to coughing at night, dyspnea, drugs used, sleep apnea, comorbidities, and smoking history. Poor sleep quality in COPD patients can result in impaired quality of life. Sleep duration, sleep efficiency, and daytime dysfunction negatively affect physical roles, mental health, emotional roles, and social functioning (Akinci et al., 2018).

METHODOLOGY

This research is explanatory research with a cross-sectional approach—the population in the study of COPD sufferers in the working area of the Ciptomulyo Health Center. The purposive sampling method was used in taking participants. Data collection in July 2021 was carried out door to door at the participant's house. Instruments used in this research are Pittsburgh Sleep Quality Index (PSQI) Questionnaire study (Buysse et al., 1989)and COPD Assessment Test (CAT)(Finch et al., 2020). The Chi-square test was used to determine the relationship between demographic data and COPD sleep quality, while the logistic regression test identified the effect between variables (p-value = 0.05).

THE RESULT

Table 1. Relationship between Respondents' Characteristics and Sufferers' Sleep Quality COPD (n=100)

Characteristics	**Sleep Quality**		
	Good (f/%)	**Bad (f/%)**	**P Value**
Gender			
Man	41 (70.7)	32 (76.2)	0.650
Woman	17 (29.3)	10 (23.8)	
Age			
Early seniors	12 (20.7)	10 (23.8)	
Late Seniors	19 (32.7)	8 (19.0)	0.310
seniors	27 (46.6)	24 (57.2)	
Level of education			
JUNIOR HIGH SCHOOL	29 (50.0)	10 (23.8)	
SENIOR HIGH SCHOOL	11 (19.0)	17 (40.5)	**0.014**
Bachelor	18 (31.0)	15 (35.7)	
Work			
Work	27(46,6)	20 (47.6)	1.00
Doesn't work	31 (53.4)	22(52,4)	

Tightness category			
Light	17 (29.3)	4 (9.5)	
Currently	41 (70.7)	20 (47.6)	**0.00**
Heavy	0 (0)	18 (42.9)	
Fatigue Level			
Low	51(87.9)	21(50.0)	
Tall	7 (12.06)	21 (50.0)	**0.00**
Smoking habit			
Light	17 (29.3)	10 (23.8)	
Currently	4 (6,9)	2(4,8)	0.71
Heavy	37 (63.8)	30 (71.4)	
Cough Category			
Light	21 (36.2)	4 (9.5)	
Currently	37 (63.8)	35 (83.3)	**0.002**
Heavy	0 (0)	3 (7,1)	

Table 1. Data analysis using Chi-Square shows that of the 100 participants with COPD, the majority were male, 73 participants were in the elderly age range, did not work, and had a habit of heavy smoking, but on average, they had good quality sleep.

Another finding from this study is that with educational background, the tightness category, fatigue level, and cough category are factors significantly related to the sleep quality of COPD sufferers.

Table 2. The Effect of Independent Variables on Sleep Quality in COPD Patients

Variable	B	P-value	OR	95% CI
Level of education	0.760	0.011	2,139	1.1-3.83
Congested	2,673	0.000	14,478	3,36-62,21
Cough	-0.415	0.623	0.660	0.12-3.45
Smoking habit	0.019	0.946	1.019	0.58-1.77

Table 2. Data analysis using logistic regression to determine the independent variables that greatly influence the sleep quality of COPD patients. The variable that most influences the sleep quality of COPD patients is breathlessness, with an Odds Ratio (OR) value of 14. After controlling for the variable smoking cough, COPD patients who experience shortness of breath have a risk of sleep quality disturbance 14 times higher than COPD patients who do not experience breathlessness.

DISCUSSION

The analysis results show that the demographic data related to the factors that affect the sleep quality of COPD patients is only the level of education. The research showed that most participants had junior high school education, while the second place was with an undergraduate education background. The level of education is not directly related to the quality of sleep but is related to the level of intelligence, especially in managing emotions. Elderly with good emotional

management will improve sleep quality (Gusmao et al., 2018). In addition, when a person is given sleep hygiene education and can apply it, it will affect good sleep quality (Soleimani et al., 2016).

In addition to education, symptoms of cough and fatigue are also factors related to sleep quality in this study. The analysis of this study showed that the fatigue level of most participants was low, with moderate cough characteristics. While sleeping at night, COPD sufferers often woke up due to coughing, pain, fever, and shortness of breath (Yatun et al., 2016). These symptoms cause poor sleep quality, which can cause fatigue, especially during the day, difficulty concentrating, and irritability (Budhiraja et al., 2015b).

In addition to the findings above, the factor that most dominate the sleep quality of COPD patients is the shortness of breath that the patient feels. The shortness of breath during sleep causes the reticular activation system (SAR) to increase and release catecholamines such as norepinephrine which causes individuals to wake up and cause sleep disturbances (Budhiraja et al., 2015b). Sleep disorders due to illness will activate the sympathetic nerves. Active sympathetic nerves make patients unable to relax, so they cannot cause drowsiness and experience sleep disturbances (Tsai, 2017). Respiratory diseases often affect sleep quality; patients with chronic diseases such as emphysema with shortness of breath often cannot sleep without two or three pillows to elevate their heads. Asthma, bronchitis, and allergies change the breathing rhythm and disturb sleep. Hypnotics or sleeping pills can disrupt NREM sleep in stages 3 and 4 and suppress REM sleep (Budhiraja et al., 2015b).

Shortness of breath is the reason most patients with COPD seek medical attention. As lung function deteriorates, dyspnoea becomes more bothersome. Worsening of the disease causes shortness of breath when moving a little, and over time there is severe shortness of breath even when at rest, especially in the season when the air is cold and foggy (Zohal et al., 2014).

Congested conditions can also affect the patient's sleep quality of life. This decrease in sleep quality is because COPD symptoms that appear in the morning and at night are significantly more likely to have decreased sleep quality associated with poorer health than those who do not suffer from COPD (Budhiraja et al., 2015). Shortness of breath that often appears causes patients to reduce daily activities such as self-care, mobility, eating, dressing, and household activities. Patients also tend to reduce interaction with the environment and social activities.

CONCLUSIONS AND RECOMMENDATIONS

The results showed that the variables that had a significant relationship with the sleep quality of COPD patients included: level of education, shortness of breath, fatigue, and cough symptoms felt by COPD patients. Another finding found in this study was that the majority of the participants' sleep quality range was still in the good range because the level of fatigue was still in the range with moderate cough symptoms.

Factors that greatly affect the sleep quality of patients with shortness of breath, with an OR value of 14. It can be concluded that COPD patients who have symptoms of shortness of breath have a risk that the quality of sleep will decrease

14 times worse than COPD patients who do not experience shortness of breath after being controlled by smoking and coughing variables.

It is hoped that COPD patients will participate in the PKM program regularly to carry out examinations and an active rehabilitation program to reduce symptoms, especially shortness of breath which impacts sleep disturbances. Increasing the quality and quantity of patient sleep is hoped to improve the quality of life for COPD patients and increase independence. In addition, the active role of PKM Ciptomulyo in improving the rehabilitation program focuses not only on pharmacological treatment but also on the effect of the symptoms felt by patients, especially psychological disorders, which also greatly impact the patient's recovery. The intervention of breathing exercises, breathing training, and counselling assistance can be given to COPD patients. It is hoped that this research can be used as a reference in providing interventions for COPD patients.

ADVANCED RESEARCH

It is hoped that further research and studies with more emphasis on improving sleep quality by improving respiratory function through appropriate interventions to improve the patient's respiratory status.

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