



Characteristics affecting sleep quality of COPD patients[☆]



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KEYWORDS

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Abstract

Objective: This study aimed to identify characteristics affecting the poor sleep quality of COPD patients.

Method: This quantitative study used a cross-sectional approach, involving 200 COPD patients from three referral hospitals in Jakarta, Indonesia. We employed COPD Assessment Test (CAT) and Pittsburgh Sleep Quality Index (PSQI) to collect data.

Results: The study revealed that patients with poor sleep quality (66%) were nearly two times more than those with good sleep quality (34%). Sleep duration value was the highest, showing that this component was the main problem among COPD patients. Poor sleep quality is relatively higher among married males, aged equal to or more than 62 years old, with lower educational level, family earnings below national minimum salary, etc.

Conclusion: Patients with moderate to severe dyspnea were 2.28 times more likely to have poor sleep quality ($p = .016$; $OR = 2.28$).

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Introduction

Chronic obstructive pulmonary disease (COPD) is amongst the highest prevalence lung disease and the cause of mor-

tality worldwide. It is characterized by the progressive obstruction of lung airflow, particularly the expiratory flow resulted in dyspnea.¹ According to World Health Organization (WHO), the prevalence of COPD reached approximately 274 million cases in 2012 and is estimated to grow to 400 million cases by 2020, with half of the cases occur in the developing countries, including in Indonesia.² Currently, COPD is the fourth leading cause of death globally, and it is predicted to rise to the third cause of death in 2020. Over 3 million mortalities were caused by COPD in 2012, corresponding to 6% of total mortalities around the globe. Today, Indonesia has the world's fifth highest rate of COPD with

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the number of cases reached about 7.8 million cases. COPD also becomes the sixth top cause of deaths in Indonesia. The number of cases in Jakarta province alone accounted for 2.7%.¹

Individuals with COPD frequently have difficulties to get air out of the lungs due to a gradual decline of elasticity in small airways. COPD is commonly described as chronic bronchitis, emphysema, or a combination of the two.³ Clinical manifestations may include dyspnea that often increases with activities and age; a chronic cough; increased production of sputum; and smoking habits with a Brinkmann index of ≥ 200 (the number of cigarettes consumed per day multiplied by the smoking years).¹ The presence of these clinical manifestations will significantly affect individuals ability to meet their needs, including sleeping needs.

COPD patients commonly experience physiological changes during sleep, such as alterations in central respiratory control, airways resistance and respiratory muscle contractility.⁴ These changes, combined with progressive and reversible airflow limitations may lead to a decreased central respiratory drive and hypotonia of respiratory muscles, resulting in hypoventilation or a decline of gas exchange while sleeping. Hypoventilation may, furthermore, causes severe hypoxemia. If hypoxemia occurs, COPD patients will be more likely to have poor sleep quality.⁵

Nurses and other health professionals need to carefully consider factors that may contribute to the sleep quality of COPD patients. When symptoms worsen, patients will be at higher risks of having poor sleep quality. If this condition is not resolved, patients will have problems to concentrate, make decisions or perform daily activities. In fact, good sleep quality in COPD patients is of critical importance for recovery and healing process of damaged lung tissues.⁶ Good sleep quality can, accordingly, affect the quality of COPD patients' life.

Method

Design, sample and data collection

This study employed descriptive design with a cross-sectional approach to identify characteristics affecting the sleep quality of COPD patients. The study was conducted with a purposive sample of 200 COPD patients in outpatient units of three referral hospitals in DKI Jakarta Province, Indonesia. The inclusion criteria of participation were: patients with no severe dyspnea complaints, and having normal respiratory rate ranged from 16 to 20 times/min. We examined patients' respiratory complaints using the COPD Assessment Test (CAT) and measured their sleep quality using the Pittsburgh Sleep Quality Index (PSQI). The instruments were tested for their validity and reliability, with the value of $r = .361$ and $\alpha = .706$.

Data analysis

We analyzed patients' characteristics, such as age, sex, educational level, marital status, Body Mass Index (BMI), comorbidities, smoking habits, number and type of cigarettes, exacerbation history, CAT and PSQI scores. We furthermore assessed the interrelationships of CAT score

and patients' sleep quality. Numerical data were examined using independent t -test and Mann-Whitney test, whereas categorical data were examined using the Chi-Square test.

Ethical considerations

Our study received ethical approval from the Ethical Committee of Faculty of Nursing Universitas Indonesia and the Ethical committee of the three hospitals. Study data were anonymised. The participants had authority for and gave written informed consent before participation.

Results

A total of 200 COPD patients who attended outpatient units and met the study criteria was analyzed. Tables 1–3 presented the patients' characteristics, including age, sex, education, marital status, family income, BMI, length of diagnosis, comorbidities, smoking habits, number of cigarettes consumed, types of cigarettes, exacerbation history, and severity of dyspnea. On average, patients were elderly, aged 67.6 years old (95% CI, 60.3–63.17) and over half were males (67.5%). Most patients attended elementary and junior high school (44%), married (71%) with the average family earnings of IDR 2,000,000, ranging broadly from IDR 500,000 to IDR 25,000,000. Patients' BMI score was within the normal range both for females (30.8%) and males (43.7%). The majority had no comorbidities (44.5) and had no exacerbation history (67%) which might be classified as mild COPD (GOLD, 2017), and the average length of diagnosis was 12 month, varied from 3 to 276 months. More than half of patients had smoking habits with daily consumption of over 20 cigarettes (57.5%), and the type was filter cigarettes (56.6%). Over three quarter reported moderate to severe dyspnea (77.5%).

Patients with poor sleep quality were virtually two-folded (66%) higher than those with good sleep quality (34%) [Table 4]. Median PSQI score was 6, ranging widely from 2 to 19. Sleep duration score was the highest, indicating that this component became the main problem among COPD patients. The PSQI component ordered from highest to smallest value was sleep duration, sleep disturbances, sleep latency, subjective sleep quality, daytime dysfunction, habitual sleep efficiency, and use of sleeping medication [Table 5].

Of patients' characteristics, only dyspnea complaints that have a significant association with sleep quality ($p = 0.016$). The analysis showed that the *OR value* was 2.28 (CI 95% = 1.15–4.51) meaning that COPD patients with moderate to severe dyspnea complaints were 2.2 times more likely to have poor sleep quality [Table 6].

Discussion

In this study, most COPD patients were elderly, aged 61.76 years old on average. Previous studies supported our findings and reported that the majority of COPD patients aged over 60 years old (64.78%–66.3%)^{7,8} with an average age of 64 years old.⁹ The pulmonary functions deteriorate among healthy elderly population and even worse among elderly COPD patients.¹⁰ A study by Mannino and Davis¹¹

Table 1 Patients characteristics ($n = 200$).

No.	Patients' characteristic(s)	<i>n</i>	(%)
1	<i>Sex</i>		
	a. Male	135	67.5
	b. Female	65	32.5
2	<i>Education</i>		
	a. No education	11	5.5
	b. Elementary/Junior High School	88	44.0
	c. Senior High School	65	32.5
	d. University	36	18.0
3	<i>Marital status</i>		
	a. Unmarried/Widowed/widower	58	29%
	b. Married	142	71%
4	<i>BMI by sex</i>		
	<i>Females</i>		
	a. Underweight	9	13.8
	b. Normal	20	30.8
	c. Overweight	19	29.2
	d. Obesity	17	26.2
	<i>Males</i>		
	a. Underweight	30	22.2
	b. Normal	59	43.7
	c. Overweight	23	17.0
	d. Obesity	23	17.0
5	<i>Comorbidities</i>		
	a. None	89	44.5
	b. 1 comorbidity	67	33.5
	c. >1 comorbidities	44	22.0
6	<i>Smoking habits</i>		
	a. Yes	113	56.5
	b. No	87	43.5
7	<i>Number of cigarettes consumed</i>		
	a. ≥ 20 cigarettes per day	48	42.5
	b. <20 cigarettes per day	65	57.5
8	<i>Types of cigarettes</i>	64	56.6
	a. Filter	49	43.4
	b. Non-Filter		
9	<i>Exacerbation history</i>		
	a. Yes	66	33.0
	b. No	134	67.0
10	<i>Severity of dyspnea</i>		
	a. Mild	45	22.5
	b. Moderate to Severe	155	77.5

Table 2 Patients' age ($n = 200$).

Patients' characteristic(s)	Mean	SD	Min-max	CI95%
Age	61.76	10.089	22-86	60.3-63.17

Table 3 Family income and length of diagnosis ($n = 200$).

Variable	Median	Min-max	CI95%
Family income	2,000,000	500,000-25,000,000	2,416,721-3,434,279
Length of diagnosis	12	3-276	20.50-30.63

Table 4 Patients' sleep quality (n= 200).

Variable	n	(%)
Sleep quality Good Poor	68 132	34.0 66.0
Total	200	100

Table 5 Components of sleep quality (n= 200).

Components of sleep quality	Median	Min-max	C195%
Subjective sleep quality	1.00	0-3	0.90-1.11
Sleep latency	1.00	0-3	0.88-1.13
Sleep duration	2.00	0-3	1.58-1.85
Habitual sleep efficiency	0.00	0-3	0.25-0.42
Sleep disturbances	1.00	0-3	1.08-1.22
Use of sleeping medications	0.00	0-3	0.19-0.36
Daytime dysfunction	1.00	0-3	0.65-0.87
Global (PSQI) score	6.00	2-19	5.88-6.61

predicted mortality and readmission in a follow-up period among elderly COPD patients might be up to 7 years.

Our study also found that most COPD patients were males. A previous study supported this finding and reported that male COPD patients accounted for 80.28%.⁸ Our study furthermore showed that patients education was on the elementary and junior high school level, married with family earnings of IDR 2,000,000. Elderly patients, especially those who have a lower educational level might be no longer employed and their earnings might be coming from a pension or other family members.

Our analysis indicated that the majority of patients had a normal BMI score. This result implied that the likelihood of COPD-related mortality is relatively lower among this population compared to those with underweight. Guo et al.¹² stated that underweight increased the risk of mortality by 40%, due to lung muscles weaknesses, impaired gas exchange, impaired immune system, and decline in metabolically and functionally active fat-free mass.

Our findings showed that 33.5% of patients had one comorbidity and 22% had more than two comorbidities, with the highest prevalences were hypertension, congestive heart failure (CHF), and diabetes mellitus. COPD has been the primary cause of pulmonary and cardiopulmonary hypertension, contributing to 80-90% of all lung diseases.¹² Pulmonary hypertension in COPD patients can be resulted from smoking habits that alter intrapulmonary blood circulation. Apparently, COPD patients are at risk of having one or more comorbidities.

Over half of the patients in our study had smoking habits, with the consumption of over 20 cigarettes per day. Most of them reported that they usually smoke filter cigarettes but then quit smoking since diagnosis. These results were in line with the study conducted by Turbaga¹³ reporting that smokers accounted for 68% of COPD patients. COPD frequently occurs among smokers. The increasing number of cigarettes consumed would increase the risk of COPD.¹⁴ Smoking habits, accordingly, has been one of the major causes of COPD.

The result of the research showed 33% of patients in this study reported exacerbation history and 77% complained

moderate to severe dyspnea. The signs of exacerbation may include worsening dyspnea and cough, accompanied by deepening sputum color. Patients with mild exacerbation may be admitted to the Emergency Unit for 0-1 times per year without the history of hospitalization, whereas patients with moderate to severe exacerbation may be admitted to the emergency room for more than 1-2 times per year.

Our analysis confirmed that most patients had poor sleep quality with the average score of 6 (±32.6), where good sleep quality = PSQI score ≤5 and poor sleep quality = score ≥5). The analysis was consistent with a previous study performed by Kang¹⁵ regarding sleep quality among COPD patients in Seoul, Korea. The study reported that 66% of patients complained of poor sleep quality with the average PSQI score was 5.4 (±3.1). Similarly, a study was undertaken by Sharma¹⁶ in a teaching hospital in India, and Roberts¹⁷ in 2016 in Westmead Hospital, Australia. The studies revealed that the proportion of patients experiencing poor sleep quality was 68% in India, and 80% in Australia. In Indonesia, a study showed that 66.1% of COPD patients had poor sleep quality with the average score was 6.70.¹⁸

Findings in this study also showed that 34% of COPD patients had poor sleep quality. Individuals with over 6 to 12 months of chronic illnesses learn to cope and adapt to their conditions by performing psychological, lifestyle, and environmental modifications.¹⁹ Besides, some of them may need to take medications, such as benzodiazepines, antidepressants, anticonvulsants, antipsychotics, or antihistamines in order to help them meet their sleep needs.²⁰

Sleep problems frequently increase with age. Difficulties to fall asleep and remain asleep are commonly increasing at the age of 40.¹⁰ PSQI, consisting of seven components, is used to assess sleep quality.²¹ The results of this study revealed that the sleep duration of COPD patients was 5 to 6 h/day, mostly shorter than 6-8.5 h/day as recommended for the elderly.²² Also, the median score of the PSQI's sleep duration component was the highest with the value of 2.00 (±.97), indicating that patients have a lower quality of sleep duration. Sleep problems among the elderly may be caused by the gradual death of neurons called nucleus preoptical ventrolateral that plays an essential role to control the sleep pattern.²³

The second highest score was on the sleep disturbances component with the median score of 1.00 (±.47). Our analysis, furthermore, showed that these disturbances occurred for less than once per week and is classified as mild sleep disturbances. This level of disturbance includes frequent wake-ups during the night which might be caused by psychological discomforts, or urgency to use the bathrooms in the night.

Our analysis exhibited a significant association between the severity of dyspnea (CAT) with sleep quality among COPD patients (p = .016). Our analysis, furthermore, demonstrated that patients with moderate to severe dyspnea were 2.28 times more likely to suffer from poor sleep quality. These findings were consistent with the study conducted by Hasanah¹⁸ who highlighted the relationship between dyspnea complaints and poor sleep quality (p = .001). Her study also showed that there was 68% of patients experienced moderate dyspnea and 14% who experienced severe dyspnea.

Table 6 Interrelationships of patients' characteristics and sleep quality of COPD patients ($n=200$).

Patients' characteristics	Sleep quality		<i>p</i>
	Good	Poor	
Age (years)	61.93	61.67	0.867 [§]
Sex			
Male	49 (36.3%)	86 (63.7%)	0.323 [¥]
Females	19 (29.2%)	46 (70.8%)	
Education			
None	3 (27.3%)	8 (72.7%)	0.330 [¥]
Elementary/Junior high school	33 (37.5%)	55 (62.5%)	
Senior high schools	17 (26.2%)	48 (73.8%)	
University	15 (41.7%)	21 (58.3%)	
Income (rupiahs)	≥2,000,000	≤2,000,000	0.608 [‡]
Marital status			
Unmarried/divorced	21 (36.2%)	37 (64.8%)	0.674 [¥]
Married	47 (33.1%)	95 (66.9%)	
Male's BMI			
Underweight	8 (26.7%)	22 (73.3%)	0.124 [¥]
Normal	28 (47.5%)	31 (52.5%)	
Overweight	6 (26.1%)	17 (73.9%)	
Obesity	7 (30.4%)	16 (69.6%)	
Female's BMI			
Underweight	4 (44.4%)	5 (55.6%)	0.739 [¥]
Normal	5 (25.0%)	15 (75.0%)	
Overweight	5 (26.3%)	14 (73.7%)	
Obesity	5 (29.4%)	12 (70.6%)	
Comorbidities			
None	30 (33.7%)	59 (66.3%)	0.997 [¥]
1 comorbidity	23 (34.3%)	44 (65.7%)	
>1 comorbidities	15 (34.1%)	29 (65.9%)	
Length of diagnosis (months)	16	12	0.125 [‡]
Smoking habits			
Yes	40 (35.4%)	73 (64.6%)	0.634 [¥]
No	28 (32.2%)	59 (67.8%)	
Exacerbation history			
Yes	19 (28.8%)	47 (71.2%)	0.275 [¥]
No	49 (36.6%)	85 (63.4%)	
CAT			
Mild	15 (33.3%)	12 (26.6%)	0.016 ^{¥,*}
Moderate to severe	53 (34.2%)	120 (77.4%)	

* Significant.

§ *t*-test.

‡ Mann-Whitney test.

¥ Chi-square test.

Median score of sleep quality among COPD patients were 6,²⁻²⁴ indicating poor sleep quality (66%) with the highest PSQI score on the component of sleep duration. The severity of dyspnea was significantly associated with poor sleep quality ($p=.016$). COPD patients with moderate to severe dyspnea were 2.28 times more likely to experience poor sleep quality.

Our study suggested nurses particularly in the pulmonary clinics to perform a thorough assessment of sleep needs and design necessary care plans to promote better sleep

quality among COPD patients and to address sleep problems among those who experienced moderate to severe dyspnea. We underlined the needs of further studies to compare the sleep quality between COPD patients in the outpatient and inpatient units.

Conflict of interests

The authors declare no conflict of interest.

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