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Factors Affecting Oxygen Saturation and Length of Stay in COPD Patients With Semifowler Positions at Hermina Ciputat Hospital

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ABSTRACT

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is a lung disease which has a chronic obstruction in airway that can interefere normal respiration led to death. Patients with COPD usually show symptoms such as dyspnea that can trigger the appearance of tightness and decreased saturation. The semi-fowler position is a position that can be chosen by patients who have difficulty breathing and in COPD patients is expected to optimize lung development so that oxygen saturation becomes increased. Given the many factors that contribute to oxygen saturation in patients, it is important to control the factors that affect oxygen saturation in patients who get a semi-fowler position. In addition, given the high prevalence of COPD, it is important for hospitals to identify factors that affect the length of day of treatment of patients with COPD. Identification of these factors can help health workers to plan treatment programs to plan the length of the day of treatment of patients who enter the hospital. **Objective:** to identify factors that influence oxygen saturation and the length of days of treatment in COPD patients who get semi-fowler positions at Hermina Ciputat Hospital. **Methods:** Data collection was carried out from January 2020 to October 2021 using the cross-sectional method by non-probability sampling through medical record data on 84 inpatients. The analysis test used in this study is the T-test and subsequently multivariate analysis is carried out using linear regression tests. **Results:** Based on the analysis test, the factors that affect oxygen saturation are gender, smoking history, and initial saturation value. While the factors that affect the length of treatment are the history of smokers and the history of comorbid. Respondents who had a history of smoking would experience a decrease in oxygen saturation by 0.3888. **Conclusion:** Preventive interventions through smoking-related health education need to be done to reduce the severity in patients with COPD who are hospitalized.

Keyword: COPD, Length of Stay, Factors, Oxygen Saturation, Semi Fowler

ABSTRAK

Latar belakang: *Penyakit Paru Obstruktif Kronik (PPOK) adalah penyakit paru-paru yang memiliki obstruksi kronis di jalan napas yang dapat menyimpulkan respirasi normal yang menyebabkan kematian. Pasien dengan PPOK biasanya menunjukkan gejala seperti dispnea yang dapat memicu munculnya sesak dan penurunan saturasi. Posisi semi fowler merupakan posisi yang dapat dipilih oleh pasien yang mengalami kesulitan bernapas dan pada pasien PPOK diharapkan dapat mengoptimalkan perkembangan paru-paru sehingga saturasi oksigen menjadi meningkat. Mengingat banyak faktor yang berkontribusi terhadap saturasi oksigen pada pasien, penting untuk mengontrol faktor-faktor yang mempengaruhi saturasi oksigen pada pasien yang mendapatkan posisi semi-fowler. Selain itu, mengingat tingginya prevalensi PPOK, penting bagi rumah sakit untuk mengidentifikasi faktor-faktor yang mempengaruhi lamanya hari perawatan pasien dengan PPOK. Identifikasi faktor-faktor ini dapat membantu petugas kesehatan untuk merencanakan program perawatan untuk merencanakan lamanya hari perawatan pasien yang masuk ke rumah sakit.* ***Tujuan:*** *untuk mengidentifikasi faktor-faktor yang mempengaruhi saturasi oksigen dan lamanya hari pengobatan pada pasien PPOK yang mendapatkan posisi semi-fowler di RS Hermina Ciputat.* ***Metode:*** *Pengumpulan data dilakukan sejak Januari 2020 hingga Oktober 2021 dengan menggunakan metode cross sectional, yaitu mengambil data dengan teknik non-probability sampling melalui data rekam medis pada 84 pasien rawat inap. Uji analisis yang digunakan dalam penelitian ini adalah uji-T dan selanjutnya dilakukan analisis multivariat dengan menggunakan uji regresi linier.* ***Hasil:*** *Berdasarkan uji analisis, faktor-faktor yang mempengaruhi saturasi oksigen adalah jenis kelamin, riwayat merokok, dan nilai saturasi awal. Sedangkan faktor-faktor yang mempengaruhi lamanya pengobatan adalah riwayat perokok dan riwayat komorbid. Responden yang memiliki riwayat merokok akan mengalami penurunan saturasi oksigen sebesar 0,3888.* ***Kesimpulan:*** *Intervensi pencegahan melalui pendidikan kesehatan terkait merokok perlu dilakukan untuk mengurangi keparahan pada pasien dengan PPOK yang dirawat di rumah sakit.*

Kata Kunci: *COPD, Lama Rawat Inap, Faktor, Saturasi Oksigen,*

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Introduction:

COPD is a lung disease characterized by persistent respiratory symptoms and limited airflow due to blocked airway and/or alveolar abnormalities caused by harmful particles or gases. COPD affects 65 million people worldwide in moderate to severe severity. COPD is one of the 4 main non-communicable diseases that 60% cause death in Indonesia (Kemenkes RI, 2017). The prevalence of COPD disease in Indonesia is 3.7% of the number of non-communicable diseases recorded in Riset Kesehatan Dasar RI (RISKESDAS) tahun 2013. One of the risk factors for COPD is a pattern of living with smoking habits. According to RISKESDAS (2018), chronic obstructive pulmonary disease was found in active smokers by 62.9% in men and by 4.8% in women. The prevalence of COPD incidence at Hermina Ciputat Hospital increased in 2021 with the number of cases of 3383 patients during the period January to July 2021 (Hermina Hospital Medical Record Data, 2020).

Patients with COPD usually show symptoms such as dyspnea, chronic cough both productive and non-productive, low exercise capacity, wheezing sounds heard when the patient breathes, to weight loss (National Clinical Guideline Center, 2010). Of all the symptoms, dyspnea is the most discomfort in patients with COPD that can trigger the onset of stress (Parveen et al., 2014).

Fowler's position is defined as one of the non-pharmacological interventions performed by positioning the head and body as high as 45 degrees. The fowler position is the position chosen by people who have difficulty breathing and have heart problems (Berman & Snyder, 2010). The position of the semi fowler or high fowler will give rise to gravity that will pull the diaphragm down so as to affect the expansion of the lungs more expanding, so that the osigen that enters adequately and oxygen saturation is in the normal range (Berman & Snyder, 2010). Research conducted by Prastika (2018) showed results that the semi-fowler position is more effective in reducing shortness of breath compared to the position of fowler when undergoing nebulizer therapy (Prastika, 2018). Semifowler position is also known to affect the value of oxygen saturation in patients with Congestive Heart Disease based on research conducted at Taman Husada Bontang Hospital in 2015 (Wahyuni et al, 2015).

Concomitant disease or commonly called comorbid is a factor that aggravates the patient's condition during treatment. Previous research explains that the number of comorbidities in patients is an independent factor that contributes to the death of patients with chronic obstructive pulmonary disease (Kim et al., 2021). Evidence explains that the main comorbid that has the potential to cause death in patients with moderate degree COPD is lung cancer or cardiovascular disease (McGarvey, et al., 2012). Thus identification of the presence of comorbids in patients with COPD is important to do for optimal treatment program planning.

Based on previous research above, it can be seen that the semifowler position is effective for reducing shortness of breath and optimizing lung development. Seeing the effectiveness of semi-fowler action, then every patient who enters with symptoms of shortness of breath, will get a semi fowler position in the treatment process at Hermina Ciputat Hospital. Given the many factors that contribute to oxygen saturation in patients, it is important to control the factors that affect oxygen saturation in patients who get a semi-fowler position. In addition, given the high prevalence of COPD, it is important for hospitals to identify factors that affect the length of day of treatment of patients with COPD. Identification of these factors can help health workers to plan treatment programs to plan the length of the day of treatment of patients who enter the hospital.

COPD really has a significant burden on patients and also on the healthcare system. More than 60% of hospital admissions is the direct cost of the management of COPD (Britton, 2003). Few studies have examined the effect of repeated admissions on the length of hospital stay (LOS) in COPD patients. Positive association was found between LOS and the number of COPD admissions in Australia (Crockett, 2000). To reduce long hospital stays

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for COPD patients, a marker of quality in COPD management in secondary care should be made. Health care provider factors that have predicted LOS include the configuration of hospital units (George, 2011). One of the configuration is by giving the semi-fowler position to COPD patients.

Methods:

The type of research method used is descriptive analytical and taken cross-sectional. This descriptive research method will provide an overview of COPD patients who entered hospitalization at Hermina Ciputat Hospital within a certain period of time. Analytical research was conducted to look for factors that affect oxygen saturation and the length of days of treatment in COPD patients who get semi-fowler positions.

The population of this study is all COPD patients at Hermina Ciputat Hospital. The sample of this study is an inpatient COPD patient at Hermina Ciputat Hospital with inclusion criteria is an inpatient COPD patient who gets a semi-fowler position as a mandatory intervention. The exclusion criteria are patients who have a history of being infected with Covid-19. This study used total sampling, which included all participants who met the criteria for inclusion and exclusion. The total number of respondents included in this study was 84 people.

This study was conducted by Hermina Ciputat Hospital with a period of patient hospitalization from January 2020 to October 2021. In this study, researchers will use secondary data sourced from patients' medical records. This research has obtained ethical approval from the Health Research and Development Ethics Committee of the Sint Carolus College of Health Sciences with letter number 101 / KEPPKSTIKSC / XII / 2021. The instrument used in this study is in the form of an excel worksheet sheet containing demographic data in the form of patient characteristics contained in the medical records file of inpatient COPD patients at Hermina Ciputat Hospital.
Preparations begin to be made from preparing research instruments to be used and taking care of licensing at the place where research is carried out. Researchers will submit ethics approval to the ethics committee at Sint Carolus High School Jakarta. After obtaining ethical approval, researchers took respondents' data from medical records contained in hospitals. All data will be processed using SPSS 24. The univariate analysis will be used to describe the characteristic distribution of COPD patient respondents involved in the study by looking at frequency distribution. For categorical data, the researcher will present the data in the form of numbers (frequencies) and percentages, while for numeric data, namely in the form of Mean and Standard Deviation.

Bivariate analysis will be used to determine the relationship between dependent variables and independent variables. A normality test has been tested, it shows the results of normal data distribution. The analysis test used in this study is the T-test. Furthermore, a multivariate analysis of variables will be carried out in this study which aims to analyze the influence of several independent variables on dependent variables at the same time using a linear regression test.

Results:

From the results of the analysis, it was found that the average length of patient care days was 3.78 (Elementary: 1.77). A total of 56.5% of respondents were male, the majority had no comorbidities (75.6%), had no history of smoking (50%). The average age of respondents was 62.56 (Elementary: 9.54) with an average initial saturation of 92.92 (SD: 5.76) (Table 1).

Tabel 1. Characteristics of Participant Studies (N=84)

Variable	N	%
LOS, Mean (SD)	3.78	1.77
Gender		
Male	48	56.50
Female	36	42.40
Age, Mean (SD)	62.54	9.54
Saturation, Mean (SD)	92.j92	5.76

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Variable	N	%
Comorbid		
Yes	19	22.10
No	65	75.60
Smoking		
Yes	41	47.70
No	43	50.00

In the results of the Bivariate test on factors affecting Oxygen Saturation in COPD patients who get a semi-fowler position, it was found that the history of smoking and the patient's initial oxygen saturation affected the final oxygen saturation of respondents. The average oxygen saturation in respondents who had a history of smoking was 98.27 (Elementary: 0.50), while the average oxygen saturation in the group with no history of smoking was 98.63 (SD: 0.62) (p-value: 0.003). Respondents who have a high initial okigen saturation average will show a high final oxygen saturation result if given a semi-fowler position (r: 0.325; p value: 0.003) (Table 2).

Tabel 2. Bivariate Test Factors Affecting Oxygen Saturation In COPD Patients Who Get Semi Fowler Positions (N=84)

	Post - Oxygen Saturation		95% CI	P-value
Variable	Mean	SD		
Gender				
Male	98.46	0.58	-0.24~0.26	0.942
Female	98.45	0.55		
Age, r	0.102			0.354
Comorbid, n (%)				
Yes	98.42	0.69	-0.34~0.26	0.787
No	98.46	0.53		
Smoking, n (%)				
Yes	98.27	0.50	-0.60~	**0.003**
No	98.63	0.62	0.12	
Pre Saturation, r	0.325			**0.003**

In the results of the multivariate analysis test using multiple linear regression tests, it was found that male respondents had the potential to experience a decrease in oxygen saturation by 0.24 when compared to female respondents (p-value: 0.034). Compared to respondents who had no history of smoking, respondents who had a history of smoking experienced a decrease in oxygen saturation by 0.388 (p-value: 0.001).

The results of the analysis also showed that the higher the initial oxygen saturation, the higher the final oxygen saturation in respondents by 0.317 (p-value: 0.002).

Tabel 3. Linear Regression Analysis of Factors Affecting Oxygen Saturation in COPD Patients Who Get Semi Fowler Positions (N=84)

Variable	Mean	SD	ß	Standardized ß	p - value
Gender					
Male	98.46	0.58	0.272	-0.240	0.034
Female 98.45	98.45	0.55	1	1	
Smoking					
Yes	98.27	0.50	0.438	-0.388	0.001
No	98.63	0.62	1	1	
Pre Saturation, r	0.325		0.031	0.317	0.002

The results of the analysis of bivariate tests on factors affecting the length of treatment days in COPD patients who get semi-fowler positions show that there is an average difference between patients who have a history of comorbidities and patients who do not have a history of comorbidities with a p value: 0.050 (Table 4).

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Tabel 4. Bivariate Test Factors Affecting The Length of Stay in COPD Patients Who Get Semi Fowler Positions (N=84)

Variable	Length Of Stay		95% CI	P-value
	Mean	SD		
Gender				
Male	3.93	1.98	-0.44-1.10	0.395
Female	3.61	1.43		
Age, r	0.06			0.583
Comorbid, n (%)				
Yes	4.47	2.34	-0.01-1.79	**0.050**
No	3.58	1.51		
Smoking, n (%)				
Ada	4.05	1.91	-2.45~	0.182
Tidak ada	3.53	1.58	1.27	
Pre Saturation, r	-0.085			0.443

In the results of linear regression analysis on factors that affect the length of treatment days in COPD patients who get a semi-fowler position, it was found that participants who did not have a history of smoking would experience a decrease in the length of treatment days by 0.117 when compared to participants who had a history of smoking (p-value: 0.05) (Table 5).

Tabel 5. Linear Regression Analysis of Factors Affecting The Length of Treatment Day in COPD Patients Who Get Semi Fowler Positions (N=84)

Variable	Mean	SD	ß	Standardized ß	*p-value*
Comorbid					
Yes	4.47	2.34	1	1	
No	3.58	1.51	-0.813	-0.195	0.287
Smoking					
Yes	4.05	1.91	1	1	
No	3.53	1.58	-0.408	-0.117	**0.05**

Discussion :

The study aimed to look for factors that affect oxygen saturation and the length of days of treatment in COPD patients who get semifowler at Hermina Ciputat Hospital. From the results of the analysis, it was found that the factors that affect oxygen saturation are gender, smoking history, and initial saturation value. The results of the analysis also showed that the factors that affect the length of the day of treatment are the history of smokers and the history of comorbidities.

The results of a double linear regression analysis showed that sex affected oxygen saturation in COPD patients who gained semifowler positions. Male respondents tended to experience a decrease in oxygen saturation during treatment. Research conducted on 2 groups of adults by gender conducted in a cohort showed there was a significant difference in oxygen saturation between the sexes where oxygen saturation in the healthy group of female adults had a higher oxygen saturation of 1.5% of the male adult group (Levental, et al., 2018). The reason underlying the findings is, physiologically women have a faster breath rate than men so it is believed to be a factor that affects higher levels of oxygen saturation in women. In addition, higher levels of progresterone in women have a direct effect on the peripheral nervous system that regulates the function of the respiratory system (Behan & Wenninger, 2008). The respiratory system in women also has fewer dead spaces which makes breathing more efficient at attracting more oxygen. (Sheel, Dominelli, & Molgat, 2016).

A history of smoking has a significant association with decreased oxygen saturation. Research conducted by Septia (2016) explained that in smokers of heavy degrees have an average oxygen saturation of 97% lower compared to light degree smokers who have an average oxygen saturation value of 98.37% so from the study it was concluded that the heavier the degree of smoking, the lower the level of oxygen saturation in the blood (Septia et al, 2016). In active smokers there will be mucus hyper secretion and chronic airway obstruction due to the habit of smokers who smoke harmful

particles that are the content of cigarettes (Oemiati, 2013). The nicotine content in cigarettes triggers the formation of a pile of mucus secretions and causes obstruction of airway cleaning by the movement of the mucosilia blocked by mucus which will cause the exchange of oxygen-rich air passing through the tissues is inhibited. The content of carbon monoxide and nitric oxide will also block the bonding of oxygen with erythrocytes. This will cause the transport of clean oxygen in the blood will be reduced (Jiang et al, 2020).

The results of linear regression analysis on factors affecting the length of the day of treatment showed that patients who had no history of smoking would experience a decrease in hospitalization days compared to patients who had a history of smoking. This is in line with previous research explaining that COPD patients who have a history of active smoking tend to have a longer period of treatment compared to patients who have no history of smoking at all (Li, et al., 2021). Smoking worsens the condition of infection in the airway thus slowing the patient's clinical improvement in treatment which affects the length of the day of treatment (Jiang et al., 2020).

Research conducted by Li et al. (2021) reported that the earlier comorbid treatment in COPD patients can reduce the length of treatment days and mortality in patients (Li, et al., 2021). Previous studies conducted a detailed assessment of the types of comorbidities in patients including heart failure, myocardial infarction, stroke, asthma and even psychological problems such as depression and anxiety (Müllerová et al., 2014). The weaknesses of this research is we included participants using non probabily sampling that limited the generazability of study finding. Future study need to include the participants randomly.

Conclusions:

The results of this study also explain that there is an influence from the patient's comorbid history on the length of treatment of COPD patients. This condition can be seen in patients who have a comorbid history of heart disease. The heart is an organ that is strongly affected by the lungs. On the other hand, COPD is a risk factor that can trigger pulmonary hypertension in patients with comorbid cardiac. These two things are mutually continuous in triggering a decrease in oxygen saturation in patients so that it takes a longer treatment day than patients without comorbidities.

However, in this study, researchers have not conducted an analysis of the influence of the type of comorbid that exists in patients related to the patient's oxygenation status and the length of the day of treatment. The results showed that all comorbidities had a significant effect on the oxygenation status of patients with COPD. Thus, in future studies it is important to identify in detail the type of comorbid patient and link it to the oxygenation status of the patient that affects the length of the day of treatment. By knowing in detail the patient's condition, planning for the treatment program can be done optimally.

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