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COPD Symptoms and Risk Factors of Respiratory Disorders in Builders

Amelia Lorensia[1]✉, Rivan Virlando Suryadinata[2], Kadek Yuli Dwi Savitri[1]
[1]Pharmacy Faculty, University of Surabaya, Jl. Raya Kalirungkut, 60293 Indonesia
[2]Medical Faculty, University of Surabaya, Jl. Raya Kalirungkut, 60293 Indonesia

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Abstract

Decreased lung function is at risk for COPD (chronic obstructive pulmonary disease). Risk identification is a strategy to improve the quality of self-management, through the identification of risk factors and early symptoms of COPD. This study aims to determine the relationship between risk factors and early symptoms of COPD in builders related to pulmonary function disorders. The design of this study was case control in Rungkut District, Surabaya in September-December 2018. The research variables were lung function disorders, risk factors and early symptoms of COPD, with ordinal data scale and chi-square test analysis. This study involved 158 respondents consisting of 79 respondents with lung function disorders and 79 respondents with no lung function disorders. The highest total risk factor for COPD in both groups was smoking, and there was no significant difference (P = 0.75) on the early symptoms of COPD in the pulmonary dysfunction group and in the group with no lung function disorders. The highest total initial symptoms of COPD in both groups were chronic cough and sputum hypersecretion. However, there was no significant difference between the two groups (P = 1.00). There was no relationship between COPD risk factors and early symptoms of COPD in the pulmonary dysfunction group and the no lung function group.

Introduction

Surabaya city is experiencing rapid economic growth and infrastructure development. The rapid infrastructure development in Surabaya causes pollution, one of which is construction pollution. Air pollution is not only obtained from vehicles, but also from various types of substances that can be carried in the air in the work environment. The effects of exposure to the substance through the respiratory tract vary widely, depending on the concentration and duration of exposure and the health status of the exposed person (Enshassi et al., 2014; Teo et al., 2019). The air quality condition of the work environment can play a role in occupational health. All construction sites generate high levels of dust (usually from concrete, cement, wood, stone, silica) and this can be carried over long distances over long periods of time. Construction dust is classified as PM10 or particles less than 10 microns that cannot be seen by the eye directly and can penetrate deep into the lungs and cause various health problems including respiratory diseases and even cancer. Toxic fumes from oils, glues, thinners, paints, processed wood, plastics, cleaners, and other hazardous chemicals that are widely used on construction sites, also contribute to air pollution (Yan et al., 2019; Vinnikov et al., 2020). One of the diseases that arise due to work is a disease of the respiratory system which results in the weakening of the lung and airway organs, which are the organs most exposed to exposure to hazardous substances in the workplace. Air pollution is associated with many respiratory diseases. Adverse effects

✉ Correspondence Address:
[1]Pharmacy Faculty, University of Surabaya, Jl. Raya Kalirungkut, 60293 Indonesia.
Email : amelia.lorensia@gmail.com ; amelia.lorensia@staff.ubaya.ac.id

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include decreased lung function, increased infection, increased respiratory symptoms, acute exacerbation of COPD (Jiang et al., 2016; Kim et al., 2018).

In Indonesia, occupational lung diseases or disorders caused by dust are estimated to be quite a lot, although the available data is still lacking. Dust that is inhaled by labor can cause abnormalities in lung function or capacity. This disorder occurs due to damage to lung tissue which can affect productivity and work quality (Habybabady et al., 2018). Therefore, it is necessary to have efforts to prevent and control the possibility of lung function disorders (Ambrosino and Bertella, 2018). According to WHO (2015) in 2000-2012, lung function disorders were the third deadliest disease for the past decade. In 2012, approximately 3.1 million died due to impaired pulmonary function COPD (Chronic Obstructive Pulmonary Disease). Across the Asia-Pacific territories surveyed, the prevalence of COPD is high, indicating a substantial socioeconomic burden (Lim et al., 2015). COPD is the fifth disease with the highest prevalence in the world, and it is quite frightening because the death rate is increasing every year. The prevalence of COPD in the moderate-severe category was highest at the age of 30 years and over, with an average of 6.3% worldwide. Although in recent years COPD has been given special attention by health agencies and the community, it is still unknown and tends to be ignored by the public. COPD in Indonesia is included in the Non-Communicable Disease (PTM) group and prevalence with ranging in 4.5% (Lim et al., 2015), which is a chronic disease that is not transmitted from person to person. Globally, the prevalence of COPD is likely to increase in the coming decades due to exposure to ongoing risk factors, aging of the population, and a lack of knowledge and awareness of the disease itself (Patel et al., 2019).

Factors that can trigger the risk of COPD are smoking, outdoor and indoor air pollution, occupational exposure (organic and inorganic dust, vapors, and chemical agents), genetic factors, age, gender, lung growth and development, socioeconomic status, and having a history of respiratory diseases can also increase the risk of developing COPD, such as asthma, chronic bronchitis and respiratory infections (Patel et al., 2019). The smoking habit is also proven to harm Body Mass Index (BMI), the results show that respondents who have smoking behavior have a BMI that is not ideal compared to not smoking. (Dare et al., 2017; Piirtole et al., 2018). Symptoms such as coughing, shortness of breath, and wheezing are common symptoms of respiratory disease, so education is needed to distinguish these symptoms as early signs of COPD disease (Patel et al., 2019). Exacerbations in COPD can reduce health-related quality of life, accelerate lung function decline, and increase mortality in individual patients. Early prevention with the right health care is the patient's first action to prevent exacerbations. Therefore it is necessary to identify risk factors and early symptoms of COPD to prevent the severity of the disease (Yawn et al., 2013).

Judging from the type of work, farmers, fishermen, and laborers are active smokers every day who have the largest proportion compared to other occupational groups. A builder or construction worker is one type of work that is prone to pulmonary dysfunction because the work environment is exposed to a lot of pollutants from street dust, debris, cement, and chemical substances such as paint. The majority of jobs at risk of developing COPD are jobs that are exposed to dust daily, such as construction workers or laborers, coal workers, factory workers, gold miners. COPD can be treated in two ways, namely pharmacological therapy (bronchodilators and corticosteroids) and non-pharmacology (smoking cessation, modification of self-management, and vaccination). Apart from being a cure, non-pharmacological therapy can also act as a preventive therapy for COPD, one of which is self-management (Franssen et al., 2019; Ambrosino & Bertella, 2018). Self-management can be a useful strategy in improving the quality of life (Dixit et al., 2016). Early prevention with the right health care is the patient's first action

to prevent disease. Therefore, it is necessary to recognize risk factors and early symptoms of COPD (Yawn et al., 2013). The purpose of this study was to determine the differences in COPD risk factors and early symptoms of COPD occurred between builders with pulmonary function disorders and builders with no pulmonary function disorders.

In patients with impaired lung function, the provision of IEC (communication, information, and education) is in the form of communication with patients by providing information about risk factors or causes of disease where smoking is one of the main causes of COPD. Steps to reduce the risk of developing COPD in the long term is to prevent adults in their productive period from smoking or being exposed to secondhand smoke. Health professionals can also help provide opportunities to discuss smoking cessation and increase motivation to quit smoking. Reducing smoking habits can also prevent respiratory diseases besides COPD. IEC can also be done to provide information about the initial symptoms that are caused and also provide education to be able to detect the presence of COPD early by measuring lung function using spirometry. Spirometric measurements are useful in health care surveillance (Patel et al., 2019). Early prevention with the right health care is the patient's first action to prevent disease. Therefore, it is necessary to recognize risk factors and early symptoms of COPD (Yawn, 2013).

Method

The research design was case control. The material of this research was in the form of information from subjects using direct questions and answers (interviews) with the respondents. The independent variable was impaired lung function and the dependent variable was the risk factors for COPD and early symptoms of COPD. A builder in this study was a person who works by relying on their physical strength and had the skills to do the work of the hand in making residential buildings and buildings in general (such as buildings), including diggers, masons, blacksmiths, carpenters, painters, and maids. Lung function disorders in this study were a condition where the FEV1 value was <70% on the measurement of lung function by spirometry (Patel et al., 2019). The research location used in this research is around the East Surabaya area, to be precise, Rungkut District in the Pandugo housing. This research was conducted from September to December 2018, with ethical tests that have been conducted and get no. 026/KE/VI/2018 at the University of Surabaya.

COPD risk factors are classified into 2 categories, namely low risk factors and high risk factors, which were obtained by dividing by median. COPD risk factors in this study consisted of: a) Smoker. A smoker is someone who has smoked at least 100 cigarettes in his lifetime and who currently still smokes (Assari and Mistry, 2018). Cigarette smoke is a major risk factor for COPD disease (Patel et al., 2019). The severity of smoking is calculated using the Brinkman Index (IB), which is the multiplication of the average number. The average cigarette smoked per day is multiplied by the length of time smoking in years, divided into three categories: mild (0-200), moderate (200-600), and heavy (>600) (Watanabe et al., 2011). b) Outdoor Pollution. Outdoor pollution is pollution that is usually found in the workplace, such as cement dust, building debris dust, wood dust, or vehicle fumes that enter the respiratory tract. Workers who work in dusty environments have a higher risk of contracting respiratory diseases for at least 5-10 years of work (Ayaabe et al., 2017). c) Indoor Pollution. Indoor pollution referred to in this study is the pollution found by respondents when doing their daily activities indoors. d) Age. The ages used in this study were adults, namely 18-60 years. The age of 60 years was chosen as the upper limit because it was considered to be in the age category where at the age of 60 and over there had been a significant decrease in FEV1 / FEC values (Thomas et al., 2019). e) Obesity. Determination of obesity status in individuals based on the measurement of Body Mass Index (BMI), a person's body weight (in kilograms)

divided by the square of height (in meters). In this study, respondents were said to be obese if they had a body mass index of ≥27kg/m² (Nuttall, 2015). f) History of Respiratory Disease. Health conditions can affect the value of a person's peak expiratory flow. The strength of the respiratory muscles can be reduced due to illness, such as asthma, post-tuberculosis, systemic diseases (Haynes, 2018).

The early symptoms of COPD were classified into 2 categories, namely low initial symptom levels and high initial symptom levels obtained by dividing by median. The baseline symptom level is low if the result is less than the median and the baseline symptom level is high if the result is more than the median. The early symptoms of COPD include: a) Chronic cough and sputum hyper-secretion is a cough that occurs almost every day for at least 3 months for 2 consecutive years (Patel et al., 2019; Kim & Criner, 2013). b) Wheezing is a high-pitched whistling sound that occurs when a person inhales or exhales (Patel et al., 2019). c) Shortness of breath, is difficulty breathing, gasping, feeling tight in the chest so that you cannot breathe freely, due to an imbalance in gas exchange causing hypoxemia and hyperapnea (Patel et al., 2019). d) The limitation in physical activity in question is the limitation in carrying out daily body movements that cannot be done at this time (Patel et al., 2019). e) The feeling of heaviness in the chest is a feeling in which the chest is like being pressed by a heavy object, tied tightly so that it makes it difficult for a person to breathe (Patel et al., 2019).

The population used in this study was an affordable population, namely builders who are currently working on a project or are active in the East Surabaya area. The sample (subject) was the part of the population that meets the criteria, namely: 18-60 years old, had been a builder for at least 5 years (Melen & Guerra, 2017), did not have chronic lung disease (such as: COPD, tuberculosis, asthma, lung cancer), and has disease. Others can affect lung function, such as heart disease, chronic kidney disease. The number of samples taken in this study uses a formula with an unknown or infinite population, namely:

$$n=(Z^2_{1-a/2}\,P(1-P))/(d^2)$$

Information:

N :Number of samples

$Z^2_{1-a/2}$:Standard normal value (if α = 0.05 then Z = 1.960)

P (1-P) :Estimated population proportion (if P = 0.1 then P (1-P) = 0.09)

d2 :Deviation tolerant (10%)

So the minimum number of samples needed in this study was 62 respondents for each group. The samples were collected using purposive sampling and consecutive sampling.

The initial development of the COPD risk factor questionnaire was by Walker et al. (2010) and Peng et al. (2018), and early symptoms of COPD from Patel et al., (2019). Data analysis was carried out by describing descriptively the risk factors for COPD and the level of early symptoms of COPD with impaired lung function and no pulmonary function disorders. Then the scoring used the median data (Q2) where the value <Q2 was initial symptom level was low and ≥Q2 was high. Data analysis of differences in early symptoms of COPD among builders who have impaired lung function and no lung function disorders using ordinal data scale and data analysis using the chi-square test.

The validity test was conducted on 30 people. In the risk factor questionnaire for COPD, with a value of rtable=0.36, it was obtained from the product moment table with a significant level of 5%. The value of rcount (no.1-9) was >0.36, so the questionnaire was declared valid. The reliability test was declared reliable if the Cronbach Alfa value was ≥0.6. The Cronbach Alfa value was 0.78 which was >0.60 so that the variable was said to be reliable. In the early symptom questionnaire of COPD, with a value of rtable=0.36 obtained from the product moment table with a significant level of 5%. The value of rcount (no.1-9) was >0.36, so the questionnaire was declared valid. The reliability test was declared reliable if the

Cronbach Alfa value was ≥0.6. The Cronbach Alfa value was 0.71 which was >0.60 so that the variable was said to be reliable.

Result And Discussion

Characteristics of respondents seen from age, the group with pulmonary function disorders was 33 years old and the most common age was 30 years, while in the group with no lung function disorders, the average was 34 years and the most common age was 20 years old. From the data obtained, the chi-square test was then performed, namely the value of P=0.08 was obtained, so that it was concluded that there was no significant difference in the group with pulmonary function disorders and no lung function disorders. In this classification, there were data that do not meet the requirements for the chi-square test because there were samples whose number was <5, but the P value was still calculated to see the difference between the lung function disorders and no lung function disorders (Table 1). The average Spirometric value obtained in the pulmonary function

Table 1. Subject Characteristics

Characteristics		Group				P value
		Lung function disorders (n:79)		**No Impaired lung function (n:79)**		
		Frequency	Percentage (%)	Frequency	Percentage (%)	
Age (years)	Late adolescence (17-25)	**13**	16.46	**20**	25.32	0.08*
	Early adulthood (26-35)	**40**	50.63	**25**	31.65	
	Late adulthood (36-45)	**17**	21.52	**21**	26.58	
	Early elderly (46-55)	**9**	11.39	**9**	11.39	
	Late elderly (56-65)	**0**	0.00	**4**	5.06	
Spirometry value (Patel *et al*., 2019)	*Mild* (FEV1 >80% *predicted*)	**59**	74.68	**0**	0	**
	Worsening (50% < FEV1 <80% *predicted*)	**20**	25.32	**0**	0	
Comorbidities	Hypertension	**1**	1.27	**1**	1.27	0.16*
	Dyslipidemia	**0**	0.00	**1**	1.27	
	None	**78**	98.73	**77**	97.46	

* does not meet the requirements for the chi-square test because the number of samples is less than 5
** Chi-square test cannot be performed because the data for the impaired and non-impaired groups cannot be compared

Age affects lung function because the increasing age of a person will increased the susceptibility to disease, especially respiratory disorders in the workforce. Lung function decreased significantly at the age above 60 years (Lowery et al., 2013). There was a significant relationship between age and pulmonary function abnormalities in labor. Age was also a risk factor for COPD because age can affect lung function. Aging affected the structure, function and control of the respiratory system. Both lung and chest wall, including the respiratory muscles undergo changed that can affect respiratory function (Patel et al., 2019; Lowery et al., 2013). In this study, age differences did not affect the results of the study. There were respondents who are under 20 years of age but had good lung function, other factors that might influence this result were the use of masks while working and the physical activities they did (Table 1).

Complementary diseases experienced by respondents were hypertension and dyslipidemia. The relationship between COPD and hypertension as in shortness of breath was explained when the body takes longer to carry out the breathing process, it caused air to start to enter before the air from the breath is exhaled. When this occurred it can produce symptoms of shortness of breath and potentially

hyperventilation. Pulmonary hypertension was high blood pressure in the heart system to the lungs when it delivers oxygen-rich blood to the heart and when oxygen-poor blood returns to the lungs. Hypertension in the lungs can occur when the arterial pressure in the lungs was greater than 25 mmHg at rest or 30 mmHg during physical activity. Long-term effects that occur on the lungs were narrowing, thickening and slowing down blood flow through the pulmonary arteries (Chandy et al., 2013; Wagner, 2015).

Dyslipidemia was one of the factors that can cause cardiovascular disease which can affect lung function. Smoking as one of the main risk factors for COPD could cause an increase in low-density lipoprotein (LDL), triglycerides and very low-density lipoprotein (VLDL) and a decrease in high-density lipoprotein (HDL) but the lipid profile was not well categorized in COPD (Kahnert e al., 2017).

Pulmonary function measurements in this study were carried out using a spirometer. Spirometer was used to measure lung function, it was needed to provide an overview of the pathophysiological severity caused by impaired lung function. Spirometers we-re used for reasons that are easier to use, inexpensive, lightweight, practical, can be carried everywhere, did not require a special place, are quite sensitive, have high accuracy, were not invasive and are sufficient to provide a number of reliable information (Haynes, 2018). Some requirements were needed, namely: not smoking 1 hour before the test, not eating heavily 2 hours before, and not doing strenuous activities 30 minutes before.

The risk factors described were based on smoking, exposure to cigarette smoke, pollution (exposure to dust and chemicals), obesity, and a history of respiratory disease/infection. A history of respiratory disease or infection was a COPD risk factor. In this study, there were no respondents who had a history of respiratory disease or infection because this risk factor was one of the exclusion criteria. The profile of answers to COPD risk factors can be seen in Table 2. The risk factors that most respondents had were smoking, exposure to cigarette smoke and outdoor pollution (Table 3).

The total number of risk factor scores owned by the respondent was assessed by adding up all the scores for each question that has been answered by the respondent. In the research on risk factors, the highest score found in the group with lung function disorders or in the group without pulmonary function disorders was at a value of 7, namely 42 people and 33 people, respectively. In the pulmonary function disorders group, the lowest score obtained was 3 and the highest score obtained was 5, while in the group without pulmonary function disorders the lowest score obtained was 0 and the highest score was 9. Categorization of risk factors in this study was divided into 2 categories namely low risk factors and high risk factors, where the categorization was done by looking at the median of the respondent's data. Median was the middle value of the observed values after being arranged regularly according to the size of the data. In this study, the median value of risk factors was obtained at 7. The risk factor was said to be low if the value was <7 and it was said to be high if the risk factor value obtained was ≥7 (Table 3). Based on the results of the chi square analysis is to see differences in risk factors for COPD in the group with pulmonary function disorders and no lung function disorders. The results were said to have a significant difference if the P value <0.05. In this study, a P value of 1.00 was obtained, so it can be concluded that there was no significant difference in risk factors for COPD in the lung function disorder group and in the no lung function disorder group.

Table 2. Frequency Distribution of COPD Risk Factors

COPD Risk Factor			Group			
			Lung function disorders (n:79)		No Impaired lung function (n:79)	
			Frequency	Percentage (%)		
Smoker	1. **What kind of cigarettes are used?**	a. Filter	59	74.68	62	78.48
		b. Non filter	20	25.32	17	21.52
	2. **What is the severity of smoking (calculated by the Brinkman Index)?**	a. Light	16	20.25	18	22.78
		b. Moderate	40	50.63	46	58.23
		c. Severe	23	29.11	15	18.99
	3. **Duration of smoking? (open question)***	a. 3 years	18	22.79	20	25.32
		b. 5 years	24	30.38	29	36.71
		c. 10 years	16	20.25	8	10.13
		d. 15 years	10	12.66	18	22.79
		e. 20 years	11	13.92	4	5.06
	4. **How many cigarettes do you smoke a day on average? (open question) ***	a. 6 cigarettes/day	9	11.39	33	41.77
		b. 12 cigarettes/day	21	26.58	20	25.32
		c. 16 cigarettes/day	30	37.97	16	20.25
		d. 24 cigarettes/day	19	24.05	10	12.66
Exposure to Cigarette Smoke	1. **Are you exposed to / inhaled cigarette smoke at the place where you live or work?**	a. Yes	69	87.34	72	91.14
		b. No	10	12.66	7	8.86
	2. **How often are you exposed to / inhaled cigarette smoke?**	a. Always/ everyday	69	87.34	72	91.14
		b. No	10	12.66	7	8.86
	3. **Since when have you been exposed to cigarette smoke? (open question) ***	a. 5 years	20	25.32	17	21.52
		b. 10 years	19	24.05	27	34.18
		c. 20 years	12	15.19	13	16.46
		d. >20 years	28	35.44	22	27.85
Outdoor Pollution	1. **Do you use a mask when you work?**	a. Yes	14	17.72	24	30.38
		b. No	65	82.27	55	69.62
	2. **When working, what part of the job do you often do? (open question) ***	a. Finishing	0	0.00	1	1.27
		b. Ceramist	4	5.06	3	3.80
		c. Bricklayer	7	8.86	7	8.86
		d. Plasterer	4	5.06	2	2.53
		e. Blacksmith	1	1.27	2	2.53
		f. Painter	1	1.27	1	1.27
		g. Digger	0	0.00	2	2.53
		h. Odd jobs	62	78.48	61	77.22
	3. **What pollution or chemicals do you breathe in? (open question) ***	a. Paint	6	7.59	3	3.80
		b. Sand, stone, cement	47	59.49	53	67.09
		c. Ceramic dust	9	11.39	15	18.99
		d. Sawdust	5	6.33	4	5.06
		e. Machine fume	12	15.19	4	5.06

COPD Risk Factor			Group			
	Lung function disorders (n:79)		No Impaired lung function (n:79)			
	Frequency Percentage (%)		Frequency	Percentage (%)		
Indoor Pollution	1. **Do you cook on a wood / charcoal stove everyday?**	a. Yes	11	13.92	7	8.86
		b. No	68	86.08	72	91.14
	2. **What is cooking?**	a. Yes	61	77.21	57	72.15
		b. No	18	22.79	22	27.85
	3. **Do you use a mask when cooking?**	a. Yes	6	7.59	5	6.33
		b. No	73	92.41	74	93.67
Obesity	**Body mass index (kg/m²)**	a. Thin (<18.5)	9	11.39	9	11.39
		b. Normal (18.5-<25.0)	66	83.54	56	70.89
		c. Overweight (25,0- <27.0)	2	2.53	9	11.39
		d. Obesity (≥27.0)	2	2.53	5	6.33

Source: Primary Data, 2018

Table 3. Frequency Distribution of Total COPD Risk Factors and Levels of COPD Risk Factors related to Pulmonary Function Disorders

COPD Risk Factor		Group				P value
		Lung function disorders (n:79)		Lung function disorders (n:79)		
		Frequency	Percentage (%)	Frequency	Percentage (%)	
Frequency Distribution of Total COPD Risk Factors						
1.	**Smoker**	79	100.00	79	100.00	0.60
2.	**Exposure to Cigarette Smoke**	77	97.47	78	98.73	0.60
3.	**Outdoor Pollution**	47	59.49	44	55.70	0.06
4.	**Indoor Pollution**	7	8.86	7	8.86	0.62
5.	**Obesity**	2	2.53	5	6.33	0.09
Levels of COPD Risk Factors related to Pulmonary Function Disorders						
Low Risk Factors		**29**	18.35	**29**	18.35	
High Risk Factors		**50**	31.65	**50**	31.65	
	TOTAL	**79**	50.00	**79**	50.00	

P value >0.05 means that there is no significant difference between the two groups

Source: Primary Data, 2018

One of the risk factors for COPD is the type of cigarette. Cigarettes are mostly used by respondents are kretek cigarettes. Kretek cigarettes are also divided into filter and non-filter clove cigarettes. The results above are in accordance with the theory which explains that non-filter cigarettes are more dangerous than filter cigarettes so that the Spirometric value of non-filter cigarettes is smaller because the nicotine and tar content in non-filter cigarettes is higher because non-filter cigarettes do not use filters so that all combustion results are from cigarettes will be sucked all and into the respiratory tract (Schulz et al., 2016). There are limitations in this study, namely that there were some respondents who changed types of cigarettes several times, so that it could affect lung function and data results, but in this

study it was overcome by asking which type of cigarette was used most often.

The use of cumulative cigarette consumption in the future can show a consistent relationship between lung disease and non-smokers, ex-smokers and smokers, which are differentiated based on the number of cigarettes smoked per day (Patel et al., 2019). In this study, the severity of smoking was calculated using the Brinkman index, namely the multiplication of the length of smoking with the average number of cigarettes smoked per day. This decrease in lung function is related to the length of smoking and the number of cigarettes smoked per day can affect lung function which is associated with decreased FEV1 values (Watanabe et al., 2011). Cigarette smoke contains a very high concentration of oxidants. The reactive oxidant substances produced by smoking induce inflammation in the lungs and airways, cigarette smoke causes inflammatory processes in the main airways, peripheral airways, and lung parenchyma, which occurs in smokers with normal lung function. Based on the results obtained above, the results obtained in both groups were in accordance with the theory, namely that the degree of exposure to cigarette smoke had a significant relationship with the severity of COPD, in this case the value of lung function. Cigarette smoke contains a very high concentration of oxidants. The reactive oxidant substances produced by smoking induce inflammation in the lungs and airways, cigarette smoke causes inflammatory processes in the main airways, peripheral airways, and lung parenchyma, which occurs in smokers with normal lung function.

Outdoor pollution in this study is pollution obtained from the work environment. Road or work exposure to dust, cigarette smoke and chemical irritants are the main causes of COPD (Jiang et al., 2016). In this study, to see the effects of exposure to dust obtained from the work environment, we used several questions, one of which was by looking at the use of masks while working, as well as seeing what work and dust were exposed to respondents to see the effect on lung function. Based on the results obtained above, the two groups obtained results in accordance with the theory, namely that the frequency of using masks has a significant relationship with the severity of COPD, in this case the value of lung function. The results obtained, both in the group with pulmonary function disorders or without pulmonary function disorders, the average FEV1 value for respondents who used masks was better than those for respondents who did not use masks, although the difference was not significant. This insignificant result may be due to other factors that can aggravate lung conditions, such as smoking. Although some occupations that are exposed to hazardous dust and gases are at risk of getting COPD, the effects are less than those of smoking.

The profile of answers to early symptoms of COPD can be seen in Table 4. The initial symptoms of COPD that most respondents had were chronic cough and hypersecretion of sputum (Table 5). The categorization of early symptoms in this study was divided into 2 categories, namely low initial symptom level and high initial symptom level, where the categorization was carried out by looking at the median of the respondent's data. In this study, the median value of early symptoms was obtained at 4. Early symptoms were said to be low if the value was <4 and said to be high if the initial symptom value was ≥4. Most of the respondents in both groups had high levels of early COPD symptoms (Table 5). Based on the test results of differences in early symptoms of COPD in the pulmonary function disorders group and the group with no lung function disorders, the P value was 0.75, where the P value obtained was greater than the α value, namely 0.05, so it could be concluded that there was no difference which was significant towards the early symptoms of COPD in the pulmonary function disorder group and in the no lung function disorder group.

Table 4. Frequency Distribution of Early Symptoms of COPD

Early Symptoms of COPD			Group			
			Lung function disorders (n:79)		Lung function disorders (n:79)	
			Frequency	Percentage (%)		
Chronic Cough and Sputum Hypersecretion	**1. Have you ever had a cough?**	a. Yes	71	89.87	71	89.87
		b. No	8	10.13	8	10.13
	2. What kind of cough did you experience?	a. Cough with phlegm	35	44.30	42	53.16
		b. Dry cough	36	45.57	29	36.71
		c. Never	8	10.13	8	10.13
	3. Do you have frequent coughs?	a. Yes	7	8.86	2	2.53
		b. No	8	10.13	8	10.13
		c. Sometimes	64	81.01	69	87.34
	4. At what times do you usually cough? (open question) *	a. Fatigue	13	16.46	15	18.99
		b. Breathe a lot of dust	15	18.99	23	29.11
		c. Too much smoking	11	13.92	12	15.19
		d. Cold weather / change of seasonusim	32	40.51	21	26.58
	5. How long have you had a cough? (open question) *	a. 2-3 days	32	40.51	37	46.84
		b. 3-4 days	16	20.25	5	6.33
		c. 5 days	3	3.80	10	12.66
		d. 1 week	14	17.72	15	18.99
		e. 3 weeks	3	3.80	4	5.06
		f. 1 month	3	3.80	0	0
		g. Never	8	10.13	8	10.13
	6. Have you ever had to go to a doctor because of a cough?	a. No, just buy medicine at the pharmacy	39	49.37	34	43.04
		b. Never	40	50.63	45	56.96
Out of breath	**1. Have you ever experienced shortness of breath?**	a. Yes	11	13.92	6	7.59
		b. No	68	86.08	73	92.41
	2. Do you often experience shortness of breath?	a. Yes	1	1.27	1	1.27
		b. No	68	86.08	73	92.41
		c. Sometimes	10	12.66	5	6.33
	3. At what times do you usually experience shortness of breath? (open question) *	a. Fatigue	5	6.33	0	0
		b. Breathe a lot of dust	4	5.06	3	3.80
		c. Too much smoking	1	1.27	3	3.80
		d. Cold weather / change of seasonusim	1	1.27	0	0
		e. Never	68	86.08	73	92.41
	4. When experiencing tightness, which part of the chest is experiencing pain? (open question) *	a. The whole chest feels tight and painful	2	2.53	1	1.27
		b. Left chest	9	11.39	5	6.33
		c. Never	68	86.08	73	92.41
	5. Have you ever had to go to a doctor because of tightness? (open question) *	a. No, just resting	11	13.92	6	7.59
		b. Never	68	86.08	64	81.01

Early Symptoms of COPD			Group			
	Lung function disorders (n:79)				Lung function disorders (n:79)	
	Frequency	Percentage (%)	Frequency	Percentage (%)		
Heavy chest pain	1. **Have you ever experienced pain or pressure and tightness in the chest?**	a. Yes	11	13.92	10	12.66
		b. No	68	86.08	69	87.34
	2. **Do you often experience pain or pressure and tightness in the chest?**	a. Yes	2	2.53	1	1.27
		b. No	68	86.08	70	88.61
		c. Sometimes	9	11.39	8	10.13
	3. **At what times do you usually experience pain or pressure and are tied to your chest? (open question) ***	a. Fatigue	7	8.86	4	5.06
		b. Breathe a lot of dust	1	1.27	4	5.06
		c. Too much smoking	2	2.53	2	2.53
		d. Cold weather / change of seasonusim	1	1.27	0	0
		e. Never	68	86.08	69	87.34
	4. **Which part of the chest is experiencing pain? (open question) ***	a. No, just resting	3	3.80	6	7.59
		b. Left chest	8	10.13	4	5.06
		c. Never	68	86.08	69	87.34
	5. **Have you ever had to go to a doctor because of the chest pain? (open question) ***	a. No, just take a break	11	13.92	10	12.66
		b. Never	68	86.08	69	87.34
Limitations of physical activity	1. **When you do your daily physical activities, have you ever stopped suddenly because you felt tired or weak?**	a. Yes	43	54.43	39	49.37
		b. No	36	45.57	40	50.63
	2. **Is there any physical activity that you normally do but can't do anymore at this time?**	a. There is	5	6.33	9	11.39
		b. There is no	74	93.67	70	88.61
	3. **What do you feel that makes you stop or rest in the middle of doing your daily physical activities? (open question)**	a. Tired and weak	26	32.91	25	31.65
		b. Dizzy	8	10.13	11	13.92
		c. Fireflies	6	7.59	2	2.53
		d. Nausea	0	0	1	1.27
		e. Out of breath	3	3.80	0	0
		f. Never	36	45.57	40	50.63
	4. **How often do you stop or rest in the middle of your physical activity? (open question)**	a. 2 times	57	72.15	53	67.09
		b. 3-4 times	11	13.92	17	21.52
		c. 5-6 times	11	13.92	9	11.39
	5. **What causes you to not be able to do physical activity? (open question)**	.a. Increasing age	5	6.33	9	11.39
		b. Never	74	93.67	70	88.61

Source: Primary Data, 2018

Table 5. Frequency Distribution of Total Early Symptoms of COPD and Levels of Early Symptoms of COPD related to Pulmonary Function Disorders

Early Symptoms of COPD	Group				P value
	Lung function disorders (n:79)		Lung function disorders (n:79)		
	Frequency	Percentage (%)	Frequency	Percentage (%)	
Frequency Distribution of Total Early Symptoms of COPD					
1. **Chronic Cough and Sputum Hypersecretion**	**30**	37.98	**40**	50.63	1.00
2. **Out of breath**	**15**	18.99	**13**	16.46	0.68
3. **Heavy chest pain**	**11**	13.92	**10**	12.66	0.55
4. **Limitations of physical activity**	**3**	3.80	**9**	11.39	0.06
Levels of Early Symptoms of COPD related to Pulmonary Function Disorders					
Low	**34**	21.52	**36**	22.78	**70**
High	**45**	28.48	**43**	27.22	**88**
TOTAL	**79**	59.00	**79**	50.00	**158**

Source: Primary Data, 2018

Research on the early symptoms of COPD in lung function disorders and no lung function disorders used a questionnaire which was assessed based on the total answer score. The questions regarding the early symptoms of COPD consist of 21 questions. The initial symptom questionnaire of COPD was divided into 4 question categories, namely chronic cough and hypersecretion of sputum, spasms, chest pressure, and limited physical activity. The assessment category was classified into 2 classifications, namely low initial symptom level and high initial symptom level. Respondents were said to have a low initial symptom level if the total value obtained was <4, while it was said that the initial symptom level was high if the total value obtained was ≥4. Cough with excessive phlegm or not occurring almost every day for at least 3 months of the year, for 2 consecutive years. Chronic cough was associated with worsening airflow obstruction and a progressive decrease in lung function (Patel et al., 2019). Two large epidemiological studies had also shown that mucus hypersecretion was significantly and consistently associated with a reduction in excess FEV1 and an increased risk of COPD. Pathophysiologically, chronic cough can be said to be an early symptom of COPD due to mucus hypersecretion, but not all COPD patients experience this symptom depending on the high number of goblet cells and enlarged submucosal glands in response to chronic irritation of the airways by cigarette smoke or other harmful particles (Patel et al., 2019; Kim & Criner, 2013).

Conclusion

There was no significant difference between the risk factors for COPD (P value = 1.00) and the early symptoms of COPD (P value = 0.75) in the pulmonary dysfunction group and the group with no lung function disorders.

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