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RESEARCH ARTICLE

Identification of Health Knowledge of Lung Function in Predicting Respiratory Disorders in Smokers

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Abstract

Chronic obstructive pulmonary disease (COPD) is a high risk for active smokers. Early assessment of the condition of lung function is needed to prevent a decrease in lung function. Knowledge of self-management that determines lung health. The purpose of this study was to determine the knowledge of lung function health in predicting respiratory disorders. The study design was a case-control from August 2018 to January 2019. Data was collected through a questionnaire, namely a lung health knowledge questionnaire consisting of categories: risk factors, symptoms, and therapy for respiratory disorders. The research sample was adult men who work in the transportation sector in Surabaya city using purposive sampling. Data analysis using chi-square. The data obtained were 300 people, consisting of 126 people without lung function disorders and 174 people with pulmonary function disorders. The risk factor knowledge category showed a significant difference (p=0.000) between the group, with the most disorders at the low knowledge level (42.0%). The symptom knowledge category showed a significant difference (p=0.000) between groups, and most of the groups with disorders were at a low knowledge level (55.8%). The category of knowledge of respiratory symptoms showed a significant difference (p=0.000) between groups, with the knowledge level in both of them mostly at a sufficient level. Therefore, low lung function health knowledge reflects low lung function conditions.

Key words: Knowledge, lung function, smoker

Identifikasi Pengetahuan Kesehatan Fungsi Paru dalam Memprediksi Gangguan Pernapasan pada Perokok

Abstrak

Penyakit paru obstruktif kronik (PPOK) berisiko tinggi dialami oleh perokok aktif. Pengkajian dini terhadap kondisi fungsi paru diperlukan untuk mencegah penurunan fungsi paru. Pengetahuan tentang manajemen diri yang menentukan kesehatan paru. Tujuan penelitian ini adalah mengetahui pengetahuan kesehatan fungsi paru dalam memprediksi gangguan pernapasan. Desain penelitian adalah *case-control* dari Agustus 2018 hingga Januari 2019. Pengumpulan data dilakukan melalui kuesioner, yaitu kuesioner pengetahuan kesehatan paru yang terdiri atas kategori: faktor risiko, gejala, dan terapi gangguan pernapasan. Sampel penelitian adalah laki-laki dewasa yang bekerja di sektor transportasi di Kota Surabaya dengan menggunakan *purposive sampling*. Analisis data menggunakan *chi-square*. Data yang diperoleh sebanyak 300 orang, terdiri atas 126 orang tanpa gangguan fungsi paru dan 174 orang dengan gangguan fungsi paru. Kategori pengetahuan faktor risiko menunjukkan perbedaan yang bermakna (p=0,000) antarkelompok dengan gangguan terbanyak pada kelompok tingkat rendah (42,0%). Kategori pengetahuan gejala menunjukkan perbedaan yang bermakna (p=0,000) antarkelompok dan sebagian besar kelompok dengan gangguan berada pada kelompok tingkat rendah (55,8%). Kategori pengetahuan gejala pernapasan menunjukkan perbedaan yang bermakna (p=0,000) antarkelompok dengan tingkat pengetahuan keduanya sebagian besar pada tingkat cukup. Oleh karena itu, pengetahuan kesehatan fungsi paru yang rendah mencerminkan kondisi fungsi paru yang rendah.

Kata kunci: Fungsi paru, pengetahuan, perokok

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Introduction

The lungs are the internal organs most susceptible to infection due to the external environment's influence due to constant exposure to particles, chemicals, and organisms in the air. If the respiratory system's primary function does not work properly, there will be a disturbance in the respiratory system.[1] Some examples of respiratory disorders are asthma, sleep apnea, chronic obstructive pulmonary disease (COPD), and lung cancer.[2] Respiratory disease is the leading cause of death and disability in the world. Approximately 65 million people suffer from COPD, and 3 million die each year, making it the third leading cause of death worldwide.[3] In Indonesia, respiratory problems such as lower respiratory tract infections and chronic respiratory diseases are among the top 10 causes of death and have become an economic burden.[4] Respiratory disorders can cause disability and death in almost all world regions, which can occur in all groups of society, especially environmental exposure and poverty, increasing vulnerability to this disease.[3]

The risk factor for smoking is one of the most significant causes of COPD.[5,6] Cigarette smoke also has a high prevalence as a cause of respiratory symptoms and pulmonary function disorders.[7] In developing countries, deaths from COPD have also increased due to the increased number of people who consume cigarettes. In China, smoking causes 12% of mortality and is expected to increase to 30% by 2030. COPD mortality is higher in males and will increase in the >45 years age group due to decreased respiratory function at 30–40 years of age.[8]

In this pandemic, chronic lung diseases (such as COPD, asthma, pulmonary fibrosis, and lung cancer) are at high risk of developing severe conditions if infected with COVID-19. Patients with severe and or uncontrolled asthma/COPD are at a higher risk of more severe COVID-19 infection.[9,10] Smokers who have COPD have a higher risk of developing severe COVID-19 pneumonia than non-smokers. Smoking and vaping are linked to inflammation of the lungs and decreased immune function in the lungs' airways, both of which can increase the likelihood of complications if exposed to COVID-19. Therefore, long-term smokers and e-cigarette users may have a higher risk of developing chronic lung conditions associated with severe cases.[11,12]

Assessment of decreased lung function is necessary to prevent, diagnose, and evaluate various respiratory disorders.[13] Spirometry is the gold standard for examining lung function and is a simple method to measure how a person inhales or exhales.[13] Failure to use appropriate diagnostic tools can further contribute to misjudgment. Although spirometry is an essential tool for diagnosing COPD, it is widely underutilized, even if available in medical practice. A survey of 943 primary care found that, although 64% of practices had access to spirometry, only 34% used it routinely.[14] So this study aims to prove whether the common knowledge assessed by the pulmonary function health knowledge questionnaire can help describe respiratory problems in smokers as someone who is at high risk for decreased lung function. It is because not all people at risk of respiratory problems are aware of the terminology of the disease.[15] Most of them have many misconceptions about respiratory disorders and lack basic knowledge about respiratory disorders.[16,17] Knowledge is essential in the management of a person's illness, self-management in order to avoid disease, and can affect a person's lifestyle.[18,19]

Self-management includes daily activities in which individuals engage and their families, communities, and health care professionals to manage chronic illnesses.[20] Individual self-management can profoundly affect their quality of life and health outcomes. Identifying factors affecting self-management can improve self-management assessments. Inform the development of interventions by identifying potential mediators and moderators of behavior or self-management processes, and help individuals with chronic disease engage in sustainable productive and self-managed processes.[20] Identification of knowledge is also essential as a preventive measure and evaluation of respiratory disorders.[17] Low level of knowledge is related to inappropriate behavioral attitudes in patients with impaired pulmonary function. So that this less specific behavior can reduce lung function, knowledge of pulmonary function health can delay disease progression, improve self-management strategies, and have a better quality of life.[21] The purpose of this study was to identify knowledge of lung function health in predicting respiratory problems in smokers

Methods

The research design was a case-control study

that was conducted from August 2018 to January 2019. Ethical clearance for this study was obtained from the Institutional Ethical Committee of the University of Surabaya, with certificate No. 034/KE/I/2018. Data was collected through a questionnaire using paper-based, namely a questionnaire on lung function health knowledge. The blueprint for the preparation of the questionnaire can be seen in Table 1. In this study, the variable measured was the knowledge level of respiratory disorders, including risk factors for respiratory disorders,[22–31] symptoms of respiratory disorders,[22,32–34] and treatment/therapy of respiratory disorders;[22,35,36] as well as pulmonary function with an FEV_1/FEC (forced expiration volume in one second/forced vital capacity) assessment.

The population used in the study was male adults. This study involved only the male gender because of differences in stigma and views so that gender can affect knowledge.[37] In addition, the risk of smoking on respiratory disorders was also influenced by gender.[38] The sample was adult men aged 18–59 years, active smokers, working in the transportation sector, as a public transport driver, and domiciled in Surabaya city, East Java. The sampling technique was purposive sampling.

The questionnaire on lung function health knowledge consisted of three categories: knowledge of risk factors for respiratory disorders, knowledge of respiratory symptoms, and knowledge of respiratory medicine and therapy. First, the correct statement was given a score of 1, while the incorrect was given a score of 0. Then they were assessed and categorized based on the previously calculated cut-off value (Table 2).

The calculations to determine the category of the results of the measurement of knowledge about respiratory symptoms are as follows:[39] good (≥76%), enough (56%), and less (<56%). The data analysis used in this study was a different

Table 1 Blueprint of the Lung Function Health Knowledge Questionnaire

Question Category	Topics	Number	References
Knowledge of risk factors for respiratory disorders	Environmental pollution risk factors	1, 2	22–24
	Risk factors for smoking	3, 4	22, 25, 26
	Work environment risk factors	5, 6	22, 27
	Residence risk factors	7, 8	22, 28
	Age risk factors	9	22, 29
	Risk factors for disease	10, 11	22, 30, 31
Knowledge of respiratory disorders symptoms	Out of breath	1, 2	22, 32
	Chronic cough	3, 4	22, 33
	Wheezing	5	22, 34
	Respiration problems	6	22
Knowledge of treatment and therapy of respiratory disorders	Medical treatment	1, 2, 3	22, 35
	Quit smoking	4, 5	22, 35
	Breathing exercises	6, 7	22
	Physical activity	8	22, 36

Table 2 Classification of Health Knowledge of Lung Function Questionnaire Assessment

Category of Knowledge Question	Number of Questions	Number of Correct Answers for the Knowledge Level Assessment		
		Good	Enough	Less
Risk factors for respiratory disorders	11	9–11	6–8	≤5
Respiratory disorders symptoms	6	5–6	3–4	≤2
Treatment and therapy of respiratory disorders	8	7–8	5–6	≤4

Table 3 Results of the Validity Test of Knowledge of Risk Factors for Respiratory Disorders

Category of Knowledge Question	No.	Question	Corrected Item–Total Correlation	Conclusion
Risk factors for respiratory disorders	1	Highly polluted environments can be at greater risk of respiratory problems.	0.492	Valid
	2	Combustion fumes can cause respiratory problems.	0.665	Valid
	3	Smoking is not a cause of respiratory problems.	0.590	Valid
	4	The more cigarettes smoked, the higher the risk factors for respiratory problems.	0.464	Valid
	5	Working in a dusty environment will not experience respiratory problems.	0.362	Valid
	6	Working in industrial areas has worse lung conditions.	0.452	Valid
	7	Living in a city is more at risk of experiencing respiratory problems than living in a village.	0.664	Valid
	8	Living in industrial areas is more at risk of experiencing respiratory problems.	0.487	Valid
	9	Increasing age does not increase the risk of respiratory problems.	0.469	Valid
	10	Some respiratory diseases can be inherited or passed down from the birth family.	0.431	Valid
	11	A history of respiratory disorders in infants and children can give disability to adulthood.	0.517	Valid
Respiratory disorders symptoms	1	Shortness of breath is not a symptom of respiratory problems.	0.487	Valid
	2	Shortness of breath can get worse during activities.	0.598	Valid
	3	A cough that doesn't go away is a symptom of a respiratory disease.	0.433	Valid
	4	Wheezing (such as a whistling sound or a 'wheezing' sound when breathing in) is a symptom of respiratory disease.	0.621	Valid
	5	Increased breathing rate is not a sign of worsening condition.	0.499	Valid
	6	Increased respiratory rate is often found in patients with respiratory disorders.	0.413	Valid
Treatment and therapy of respiratory disorders	1	Cough symptoms can be reduced with medication (medicine) given.	0.364	Valid
	2	Medications (drugs) are given only to reduce symptoms.	0.408	Valid
	3	Treatment (medicine) given can cure.	0.390	Valid
	4	Quitting smoking does not reduce symptoms.	0.556	Valid
	5	Quitting smoking makes breathing better.	0.366	Valid
	6	Breathing exercises to increase breathing effort.	0.544	Valid
	7	Breathing muscle exercises cannot reduce the symptoms of shortness of breath.	0.683	Valid
	8	Body activity program (sports) to increase tolerance for physical activity.	0.362	Valid

test of the two groups with the chi-square test to determine the differences between the groups with and without pulmonary function disorders.

Results

The subject was 30 people residing in Surabaya city. Validity and reliability tests were carried out using SPSS for Windows version 24. The validity test results of the knowledge of the risk factors for respiratory disorders showed that all questions from the three categories were valid. The questionnaire is valid if r count>table (r tabel=0.361), and Table 3 shows that the table value for 30 respondents has a value above the table value. The reliability test results were

Table 4 Knowledge Reliability Test Results of Risk Factors for Respiratory Disorders

Category of Knowledge	Reliability Statistic	
	Cronbach's Alpha	N of Item
Risk factors for respiratory disorders	0.719	11
Respiratory disorders symptoms	0.604	6
Treatment and therapy of respiratory disorders	0.672	8

Table 5 Frequency Distribution of Respondent Characteristics

Respondent Characteristics	Division of Groups based on Lung Function			
	No Impaired Lung Function (n=126)		Impaired Lung Function (n=174)	
	Frequency	%	Frequency	%
Age (years)				
Late adolescence (15–25)	0	0.0	2	1.1
Early adulthood (26–35)	5	4.0	9	5.2
Late adulthood (36-45)	58	46.0	19	10.9
Early elderly (46–55)	43	34.1	52	29.9
Late elderly (56–65)	20	15.8	25	14.4
Level of education				
No school	15	11.9	35	20.1
Kindergarten	0	0.0	2	1.2
Elementary school	58	46.0	104	59.8
Junior high school	19	15.1	19	10.9
Senior high school	34	27.0	14	8.1
BMI (kg/m^2)[40]				
Thin	15	11.9	11	6.3
Normal	87	69.0	127	73.0
Overweight	19	15.1	22	12.7
Obesity	5	4.0	11	6.3
History of disease				
Diabetes	0	0.0	4	2.3
Hyperuricemia	0	0.0	3	1.7
Hypertension	0	0.0	4	2.3
Dyslipidemia	0	0.0	3	1.7
Don't know/don't exist	126	100.0	159	91.4
Lung fungtion value (FEV^1/FVC) (%)[22]				
No decrease (≥80)	126	100.0	0	0.0
Decrease mild level (65–<80)	0	0.0	76	43.7
Decrease moderate level (50–<65)	0	0.0	94	54.0
Decrease severe level (<50)	0	0.0	4	2.3

declared reliable because they had Cronbach alpha values between 0.61–0.80 (Table 4).

The data obtained in the study were 300 people consisting of 126 people who did not experience lung function problems and 174 people who had lung function disorders. Based on the frequency of respondent characteristics, the age category in the respondent's group without pulmonary function disorders was mostly in late adulthood 36–45 years (46.0%), and those with pulmonary function disorders were most in early elderly 46–55 years (29.9%). In the education level category, elementary school education level was the highest in the two groups. In the body mass index (BMI) category,[40] respondents had normal BMI in both groups (Table 5).

Table 6 shows categories of the knowledge level of lung function health. The knowledge level of lung function health in the knowledge category of risk factors for respiratory disorders showed a significant difference (p=0.000) between the groups without pulmonary function disorders and lung function disorders. Most of the groups with impaired lung function were at the low knowledge level (42.0%). Whereas without any disruption in lung function, most of them were at a sufficient knowledge level (50.0%). In the category of knowledge of respiratory symptoms, there was a significant difference (p=0.000) between the groups without pulmonary function disorders and those with pulmonary function disorders. Most of the groups with impaired lung function were at a low knowledge level (55.8%). Whereas without any disruption in lung function, most of them were at a sufficient knowledge level (50.0%). In the category of knowledge of respiratory symptoms, there was a significant difference (p=0.000) between the groups without pulmonary function disorders and those with lung function disorders, with the knowledge level in the two groups most at the sufficient knowledge level.

Discussion

This study involved respondents with active smokers because many young people smoke, and the prevalence of smokers is increasing from year to year. Indonesia is also the third-largest cigarette consumer in the world.[41] Previous studies related to respiratory diseases and smoking had discussed the effect of smoking on the health of lung function,[42–44] related to the economy,[45] or smoking cessation.[46] In Indonesia, similar studies on the knowledge level of lung function health in smokers, such as the level of danger of smoking,[47] impact oral health,[48] are generally carried out at young ages and students. However, similar research on public transport drivers does not yet exist, and what exists is a picture of food intake, such as rickshaw drivers.[49]

The risk factor for smoking is one of the most significant influential causes of COPD.[50] Cigarette smoke also has a high prevalence as a cause of respiratory symptoms and pulmonary function disorders.[51] Assessment of decreased lung function uses a lung function test, an objective measurement of whether a person's lung function is normal or abnormal. Pulmonary function tests are usually performed based on specific indications or needs. Pulmonary function tests were carried out by assessing the function

Table 6 Categories of the Knowledge Level of Lung Function Health

Category	Knowledge Level	Division of Groups based on Lung Function				p Value*
		No Impaired Lung Function (n=126)		Impaired Lung Function (n=174)		
		Frequency	%	Frequency	%	
Risk factors for respiratory disorders	Good	20	15.9	38	21.8	0.000
	Enough	63	50.0	63	36.2	
	Less	43	34.1	73	42.0	
Respiratory disorders symptoms	Good	39	31.0	13	7.5	0.000
	Enough	63	50.0	64	36.8	
	Less	24	19.0	97	55.7	
Treatment and therapy of respiratory disorders	Good	39	31.0	13	7.5	0.000
	Enough	63	50.0	64	36.8	
	Less	24	19.0	97	55.7	

Note: *chi-square test

of ventilation, gas diffusion, pulmonary blood perfusion, and transport of O_2 and CO_2 gases in the blood.[21] Usually, assessing a person's lung function is sufficient to perform the FEV_1 pulmonary ventilation function test. Ventilatory function with good value can represent the overall lung function, and usually, other lung functions are also good. Assessment of ventilation function is closely related to the assessment of respiratory mechanics. A spirometer is used to assess the function of ventilation and record a graph of breathing based on the amount and velocity of air that is exited or entered into the spirometer.[21] In the study, pulmonary function tests were performed using a hand-held spirometer-type spirometry device. Spirometry was chosen because spirometry is the gold standard for examining lung function and is a simple method that can measure how a person inhales or exhales.[22]

Factors affecting lung function apart from knowledge include age, sex, height, weight, sex, and race.[52] Changes in the structure of the lungs are mainly associated with an increase in the size of the alveolar space without inflammation or damage to the alveolar wall, which is called senile emphysema. This microscopic emphysema increases linearly with increasing age in nonsmokers, but in smokers, a more progressive increase in alveolar space size can only be observed in specific (susceptible) individuals. Senile emphysema can be a consequence of the loss of the supporting structures of the lung parenchyma. Moreover, it has been observed that the elasticity of the lungs decreases with age. It has been postulated that this phenomenon is due more to the reduced surface tension force of the alveoli due to an increase in the size of the individual diameter compared to changes in elastin and collagen in the pulmonary parenchyma.[53]

Body mass index is often defined as body weight (kilograms) divided by height (meters) squared (kg/m^2). BMI is related to body fat, which can categorize obesity and malnutrition in both adults and children. BMI is also used to assess nutritional deficiency, where a BMI<18.5 kg/m^2 indicates nutritional deficiency. Malnutrition in COPD is associated with complications and increased mortality. COPD patients with low body weight have a lower diffusion capacity and exercise than normal-weight COPD patients. Reduced body cell mass is associated with reduced diaphragm mass and respiratory muscle mass. Malnutrition is also associated with decreased immune status, so that unwanted complications can occur, such as nosocomial lung infections and hypercapnic lung failure.[54]

A limitation in this study was that this study does not assess the severity of smoking which can affect respiratory symptoms and pulmonary function disorders.[7] Examination of lung function uses a type of hand-held spirometers, a type of spirometry that was easy and affordable. However, they differ in values from more accurate spirometry types such as bellows spirometer or rolling seal.

Conclusions

The knowledge level of lung function health, there were differences in the knowledge category of risk factors for respiratory disorders, symptoms of respiratory disorders, and treatment and therapy of respiratory disorders between groups without lung function disorders and with impaired lung function. Suggestions for future research are to increase the assessment of risk factors that can affect lung function. In addition, it is necessary to carry out similar research on respondents with different characters, such as different occupations that are at risk of exposure to respiratory problems (construction workers, mining workers, parking attendants), or differences in education, gender, and e-cigarette smokers.

Conflict of Interest

All authors stated that there was no conflict of interest in this study.

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In not so long time, GMHC journal published by Faculty of Medicine, Universitas Islam Bandung have already **accredited** by Ministry of Research, Technology and Higher Education of the Republic of Indonesia Number 30/E/KPT/2019 valid for 5 (five) years from Volume 7 Number 2 with Sinta (Science and Technology Index) Score is S2. It's also indexed in Directory of Open Access Journals (DOAJ) on 9th May 2017 and Crossref on 2nd January 2018, with DOAJ and Crossref indexing this journal are able to reach international audiences. This achievement received positive responses from researchers, lecturers and health observers alike showed by articles submitted which are triple compare to the number of articles received in its early time. The quality of the articles also show improvement both in methodology and written that will be beneficial for audiences. Research findings were best to disseminate as early as possible so they can be used properly. To support these GMHC publication which was **every 6 (six)** months in a year will publish **every 4 (four)** months in one year starting from 2017.

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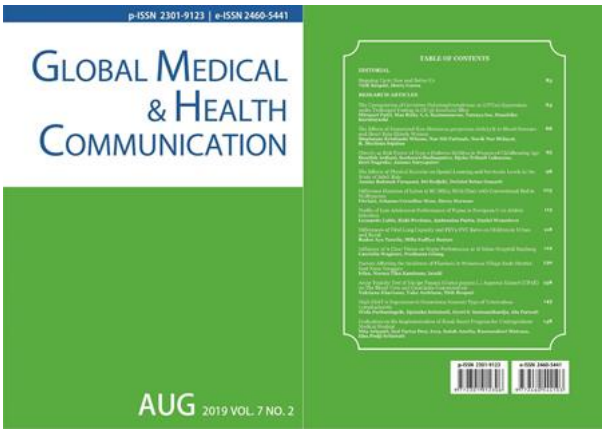

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RESEARCH ARTICLE

Identification of Health Knowledge of Lung Function in Predicting Respiratory Disorders in Smokers

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Abstract

Chronic obstructive pulmonary disease (COPD) is a high risk for active smokers. Early assessment of the condition of lung function is needed to prevent a decrease in lung function. Knowledge of self-management that determines lung health. The purpose of this study was to determine the knowledge of lung function health in predicting respiratory disorders. The study design was a case-control from August 2018 to January 2019. Data was collected through a questionnaire, namely a lung health knowledge questionnaire consisting of categories: risk factors, symptoms, and therapy for respiratory disorders. The research sample was adult men who work in the transportation sector in Surabaya city using purposive sampling. Data analysis using chi-square. The data obtained were 300 people, consisting of 126 people without lung function disorders and 174 people with pulmonary function disorders. The risk factor knowledge category showed a significant difference (p=0.000) between the group, with the most disorders at the low knowledge level (42.0%). The symptom knowledge category showed a significant difference (p=0.000) between groups, and most of the groups with disorders were at a low knowledge level (55.8%). The category of knowledge of respiratory symptoms showed a significant difference (p=0.000) between groups, with the knowledge level in both of them mostly at a sufficient level. Therefore, low lung function health knowledge reflects low lung function conditions.

Key words: Knowledge, lung function, smoker

Identifikasi Pengetahuan Kesehatan Fungsi Paru dalam Memprediksi Gangguan Pernapasan pada Perokok

Abstrak

Penyakit paru obstruktif kronik (PPOK) berisiko tinggi dialami oleh perokok aktif. Pengkajian dini terhadap kondisi fungsi paru diperlukan untuk mencegah penurunan fungsi paru. Pengetahuan tentang manajemen diri yang menentukan kesehatan paru. Tujuan penelitian ini adalah mengetahui pengetahuan kesehatan fungsi paru dalam memprediksi gangguan pernapasan. Desain penelitian adalah *case-control* dari Agustus 2018 hingga Januari 2019. Pengumpulan data dilakukan melalui kuesioner, yaitu kuesioner pengetahuan kesehatan paru yang terdiri atas kategori: faktor risiko, gejala, dan terapi gangguan pernapasan. Sampel penelitian adalah laki-laki dewasa yang bekerja di sektor transportasi di Kota Surabaya dengan menggunakan *purposive sampling*. Analisis data menggunakan *chi-square*. Data yang diperoleh sebanyak 300 orang, terdiri atas 126 orang tanpa gangguan fungsi paru dan 174 orang dengan gangguan fungsi paru. Kategori pengetahuan faktor risiko menunjukkan perbedaan yang bermakna (p=0,000) antarkelompok dengan gangguan terbanyak pada kelompok tingkat rendah (42,0%). Kategori pengetahuan gejala menunjukkan perbedaan yang bermakna (p=0,000) antarkelompok dan sebagian besar kelompok dengan gangguan berada pada kelompok tingkat rendah (55,8%). Kategori pengetahuan gejala pernapasan menunjukkan perbedaan yang bermakna (p=0,000) antarkelompok dengan tingkat pengetahuan keduanya sebagian besar pada tingkat cukup. Oleh karena itu, pengetahuan kesehatan fungsi paru yang rendah mencerminkan kondisi fungsi paru yang rendah.

Kata kunci: Fungsi paru, pengetahuan, perokok

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Introduction

The lungs are the internal organs most susceptible to infection due to the external environment's influence due to constant exposure to particles, chemicals, and organisms in the air. If the respiratory system's primary function does not work properly, there will be a disturbance in the respiratory system.[1] Some examples of respiratory disorders are asthma, sleep apnea, chronic obstructive pulmonary disease (COPD), and lung cancer.[2] Respiratory disease is the leading cause of death and disability in the world. Approximately 65 million people suffer from COPD, and 3 million die each year, making it the third leading cause of death worldwide.[3] In Indonesia, respiratory problems such as lower respiratory tract infections and chronic respiratory diseases are among the top 10 causes of death and have become an economic burden.[4] Respiratory disorders can cause disability and death in almost all world regions, which can occur in all groups of society, especially environmental exposure and poverty, increasing vulnerability to this disease.[3]

The risk factor for smoking is one of the most significant causes of COPD.[5,6] Cigarette smoke also has a high prevalence as a cause of respiratory symptoms and pulmonary function disorders.[7] In developing countries, deaths from COPD have also increased due to the increased number of people who consume cigarettes. In China, smoking causes 12% of mortality and is expected to increase to 30% by 2030. COPD mortality is higher in males and will increase in the >45 years age group due to decreased respiratory function at 30–40 years of age.[8]

In this pandemic, chronic lung diseases (such as COPD, asthma, pulmonary fibrosis, and lung cancer) are at high risk of developing severe conditions if infected with COVID-19. Patients with severe and or uncontrolled asthma/COPD are at a higher risk of more severe COVID-19 infection.[9,10] Smokers who have COPD have a higher risk of developing severe COVID-19 pneumonia than non-smokers. Smoking and vaping are linked to inflammation of the lungs and decreased immune function in the lungs' airways, both of which can increase the likelihood of complications if exposed to COVID-19. Therefore, long-term smokers and e-cigarette users may have a higher risk of developing chronic lung conditions associated with severe cases.[11,12]

Assessment of decreased lung function is necessary to prevent, diagnose, and evaluate various respiratory disorders.[13] Spirometry is the gold standard for examining lung function and is a simple method to measure how a person inhales or exhales.[13] Failure to use appropriate diagnostic tools can further contribute to misjudgment. Although spirometry is an essential tool for diagnosing COPD, it is widely underutilized, even if available in medical practice. A survey of 943 primary care found that, although 64% of practices had access to spirometry, only 34% used it routinely.[14] So this study aims to prove whether the common knowledge assessed by the pulmonary function health knowledge questionnaire can help describe respiratory problems in smokers as someone who is at high risk for decreased lung function. It is because not all people at risk of respiratory problems are aware of the terminology of the disease.[15] Most of them have many misconceptions about respiratory disorders and lack basic knowledge about respiratory disorders.[16,17] Knowledge is essential in the management of a person's illness, self-management in order to avoid disease, and can affect a person's lifestyle.[18,19]

Self-management includes daily activities in which individuals engage and their families, communities, and health care professionals to manage chronic illnesses.[20] Individual self-management can profoundly affect their quality of life and health outcomes. Identifying factors affecting self-management can improve self-management assessments. Inform the development of interventions by identifying potential mediators and moderators of behavior or self-management processes, and help individuals with chronic disease engage in sustainable productive and self-managed processes.[20] Identification of knowledge is also essential as a preventive measure and evaluation of respiratory disorders.[17] Low level of knowledge is related to inappropriate behavioral attitudes in patients with impaired pulmonary function. So that this less specific behavior can reduce lung function, knowledge of pulmonary function health can delay disease progression, improve self-management strategies, and have a better quality of life.[21] The purpose of this study was to identify knowledge of lung function health in predicting respiratory problems in smokers

Methods

The research design was a case-control study

that was conducted from August 2018 to January 2019. Ethical clearance for this study was obtained from the Institutional Ethical Committee of the University of Surabaya, with certificate No. 034/KE/I/2018. Data was collected through a questionnaire using paper-based, namely a questionnaire on lung function health knowledge. The blueprint for the preparation of the questionnaire can be seen in Table 1. In this study, the variable measured was the knowledge level of respiratory disorders, including risk factors for respiratory disorders,[22–31] symptoms of respiratory disorders,[22,32–34] and treatment/therapy of respiratory disorders;[22,35,36] as well as pulmonary function with an FEV_1/FEC (forced expiration volume in one second/forced vital capacity) assessment.

The population used in the study was male adults. This study involved only the male gender because of differences in stigma and views so that gender can affect knowledge.[37] In addition, the risk of smoking on respiratory disorders was also influenced by gender.[38] The sample was adult men aged 18–59 years, active smokers, working in the transportation sector, as a public transport driver, and domiciled in Surabaya city, East Java. The sampling technique was purposive sampling.

The questionnaire on lung function health knowledge consisted of three categories: knowledge of risk factors for respiratory disorders, knowledge of respiratory symptoms, and knowledge of respiratory medicine and therapy. First, the correct statement was given a score of 1, while the incorrect was given a score of 0. Then they were assessed and categorized based on the previously calculated cut-off value (Table 2).

The calculations to determine the category of the results of the measurement of knowledge about respiratory symptoms are as follows:[39] good (≥76%), enough (56%), and less (<56%). The data analysis used in this study was a different

Table 1 Blueprint of the Lung Function Health Knowledge Questionnaire

Question Category	Topics	Number	References
Knowledge of risk factors for respiratory disorders	Environmental pollution risk factors	1, 2	22–24
	Risk factors for smoking	3, 4	22, 25, 26
	Work environment risk factors	5, 6	22, 27
	Residence risk factors	7, 8	22, 28
	Age risk factors	9	22, 29
	Risk factors for disease	10, 11	22, 30, 31
Knowledge of respiratory disorders symptoms	Out of breath	1, 2	22, 32
	Chronic cough	3, 4	22, 33
	Wheezing	5	22, 34
	Respiration problems	6	22
Knowledge of treatment and therapy of respiratory disorders	Medical treatment	1, 2, 3	22, 35
	Quit smoking	4, 5	22, 35
	Breathing exercises	6, 7	22
	Physical activity	8	22, 36

Table 2 Classification of Health Knowledge of Lung Function Questionnaire Assessment

Category of Knowledge Question	Number of Questions	Number of Correct Answers for the Knowledge Level Assessment		
		Good	Enough	Less
Risk factors for respiratory disorders	11	9–11	6–8	≤5
Respiratory disorders symptoms	6	5–6	3–4	≤2
Treatment and therapy of respiratory disorders	8	7–8	5–6	≤4

Table 3 Results of the Validity Test of Knowledge of Risk Factors for Respiratory Disorders

Category of Knowledge Question	No.	Question	Corrected Item–Total Correlation	Conclusion
Risk factors for respiratory disorders	1	Highly polluted environments can be at greater risk of respiratory problems.	0.492	Valid
	2	Combustion fumes can cause respiratory problems.	0.665	Valid
	3	Smoking is not a cause of respiratory problems.	0.590	Valid
	4	The more cigarettes smoked, the higher the risk factors for respiratory problems.	0.464	Valid
	5	Working in a dusty environment will not experience respiratory problems.	0.362	Valid
	6	Working in industrial areas has worse lung conditions.	0.452	Valid
	7	Living in a city is more at risk of experiencing respiratory problems than living in a village.	0.664	Valid
	8	Living in industrial areas is more at risk of experiencing respiratory problems.	0.487	Valid
	9	Increasing age does not increase the risk of respiratory problems.	0.469	Valid
	10	Some respiratory diseases can be inherited or passed down from the birth family.	0.431	Valid
	11	A history of respiratory disorders in infants and children can give disability to adulthood.	0.517	Valid
Respiratory disorders symptoms	1	Shortness of breath is not a symptom of respiratory problems.	0.487	Valid
	2	Shortness of breath can get worse during activities.	0.598	Valid
	3	A cough that doesn't go away is a symptom of a respiratory disease.	0.433	Valid
	4	Wheezing (such as a whistling sound or a 'wheezing' sound when breathing in) is a symptom of respiratory disease.	0.621	Valid
	5	Increased breathing rate is not a sign of worsening condition.	0.499	Valid
	6	Increased respiratory rate is often found in patients with respiratory disorders.	0.413	Valid
Treatment and therapy of respiratory disorders	1	Cough symptoms can be reduced with medication (medicine) given.	0.364	Valid
	2	Medications (drugs) are given only to reduce symptoms.	0.408	Valid
	3	Treatment (medicine) given can cure.	0.390	Valid
	4	Quitting smoking does not reduce symptoms.	0.556	Valid
	5	Quitting smoking makes breathing better.	0.366	Valid
	6	Breathing exercises to increase breathing effort.	0.544	Valid
	7	Breathing muscle exercises cannot reduce the symptoms of shortness of breath.	0.683	Valid
	8	Body activity program (sports) to increase tolerance for physical activity.	0.362	Valid

test of the two groups with the chi-square test to determine the differences between the groups with and without pulmonary function disorders.

Results

The subject was 30 people residing in Surabaya city. Validity and reliability tests were carried out using SPSS for Windows version 24. The validity test results of the knowledge of the risk factors for respiratory disorders showed that all questions from the three categories were valid. The questionnaire is valid if r count>table (r tabel=0.361), and Table 3 shows that the table value for 30 respondents has a value above the table value. The reliability test results were

Table 4 Knowledge Reliability Test Results of Risk Factors for Respiratory Disorders

Category of Knowledge	Reliability Statistic	
	Cronbach's Alpha	N of Item
Risk factors for respiratory disorders	0.719	11
Respiratory disorders symptoms	0.604	6
Treatment and therapy of respiratory disorders	0.672	8

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Table 5 Frequency Distribution of Respondent Characteristics

Respondent Characteristics	Division of Groups based on Lung Function			
	No Impaired Lung Function (n=126)		Impaired Lung Function (n=174)	
	Frequency	%	Frequency	%
Age (years)				
Late adolescence (15–25)	0	0.0	2	1.1
Early adulthood (26–35)	5	4.0	9	5.2
Late adulthood (36-45)	58	46.0	19	10.9
Early elderly (46–55)	43	34.1	52	29.9
Late elderly (56–65)	20	15.8	25	14.4
Level of education				
No school	15	11.9	35	20.1
Kindergarten	0	0.0	2	1.2
Elementary school	58	46.0	104	59.8
Junior high school	19	15.1	19	10.9
Senior high school	34	27.0	14	8.1
BMI (kg/m^2)[40]				
Thin	15	11.9	11	6.3
Normal	87	69.0	127	73.0
Overweight	19	15.1	22	12.7
Obesity	5	4.0	11	6.3
History of disease				
Diabetes	0	0.0	4	2.3
Hyperuricemia	0	0.0	3	1.7
Hypertension	0	0.0	4	2.3
Dyslipidemia	0	0.0	3	1.7
Don't know/don't exist	126	100.0	159	91.4
Lung fungtion value (FEV^1/FVC) (%)[22]				
No decrease (≥80)	126	100.0	0	0.0
Decrease mild level (65–<80)	0	0.0	76	43.7
Decrease moderate level (50–<65)	0	0.0	94	54.0
Decrease severe level (<50)	0	0.0	4	2.3

declared reliable because they had Cronbach alpha values between 0.61–0.80 (Table 4).

The data obtained in the study were 300 people consisting of 126 people who did not experience lung function problems and 174 people who had lung function disorders. Based on the frequency of respondent characteristics, the age category in the respondent's group without pulmonary function disorders was mostly in late adulthood 36–45 years (46.0%), and those with pulmonary function disorders were most in early elderly 46–55 years (29.9%). In the education level category, elementary school education level was the highest in the two groups. In the body mass index (BMI) category,[40] respondents had normal BMI in both groups (Table 5).

Table 6 shows categories of the knowledge level of lung function health. The knowledge level of lung function health in the knowledge category of risk factors for respiratory disorders showed a significant difference (p=0.000) between the groups without pulmonary function disorders and lung function disorders. Most of the groups with impaired lung function were at the low knowledge level (42.0%). Whereas without any disruption in lung function, most of them were at a sufficient knowledge level (50.0%). In the category of knowledge of respiratory symptoms, there was a significant difference (p=0.000) between the groups without pulmonary function disorders and those with pulmonary function disorders. Most of the groups with impaired lung function were at a low knowledge level (55.8%). Whereas without any disruption in lung function, most of them were at a sufficient knowledge level (50.0%). In the category of knowledge of respiratory symptoms, there was a significant difference (p=0.000) between the groups without pulmonary function disorders and those with lung function disorders, with the knowledge level in the two groups most at the sufficient knowledge level.

Discussion

This study involved respondents with active smokers because many young people smoke, and the prevalence of smokers is increasing from year to year. Indonesia is also the third-largest cigarette consumer in the world.[41] Previous studies related to respiratory diseases and smoking had discussed the effect of smoking on the health of lung function,[42–44] related to the economy,[45] or smoking cessation.[46] In Indonesia, similar studies on the knowledge level of lung function health in smokers, such as the level of danger of smoking,[47] impact oral health,[48] are generally carried out at young ages and students. However, similar research on public transport drivers does not yet exist, and what exists is a picture of food intake, such as rickshaw drivers.[49]

The risk factor for smoking is one of the most significant influential causes of COPD.[50] Cigarette smoke also has a high prevalence as a cause of respiratory symptoms and pulmonary function disorders.[51] Assessment of decreased lung function uses a lung function test, an objective measurement of whether a person's lung function is normal or abnormal. Pulmonary function tests are usually performed based on specific indications or needs. Pulmonary function tests were carried out by assessing the function

Table 6 Categories of the Knowledge Level of Lung Function Health

Category	Knowledge Level	Division of Groups based on Lung Function				p Value*
		No Impaired Lung Function (n=126)		Impaired Lung Function (n=174)		
		Frequency	%	Frequency	%	
Risk factors for respiratory disorders	Good	20	15.9	38	21.8	0.000
	Enough	63	50.0	63	36.2	
	Less	43	34.1	73	42.0	
Respiratory disorders symptoms	Good	39	31.0	13	7.5	0.000
	Enough	63	50.0	64	36.8	
	Less	24	19.0	97	55.7	
Treatment and therapy of respiratory disorders	Good	39	31.0	13	7.5	0.000
	Enough	63	50.0	64	36.8	
	Less	24	19.0	97	55.7	

Note: *chi-square test

of ventilation, gas diffusion, pulmonary blood perfusion, and transport of O_2 and CO_2 gases in the blood.[21] Usually, assessing a person's lung function is sufficient to perform the FEV_1 pulmonary ventilation function test. Ventilatory function with good value can represent the overall lung function, and usually, other lung functions are also good. Assessment of ventilation function is closely related to the assessment of respiratory mechanics. A spirometer is used to assess the function of ventilation and record a graph of breathing based on the amount and velocity of air that is exited or entered into the spirometer.[21] In the study, pulmonary function tests were performed using a hand-held spirometer-type spirometry device. Spirometry was chosen because spirometry is the gold standard for examining lung function and is a simple method that can measure how a person inhales or exhales.[22]

Factors affecting lung function apart from knowledge include age, sex, height, weight, sex, and race.[52] Changes in the structure of the lungs are mainly associated with an increase in the size of the alveolar space without inflammation or damage to the alveolar wall, which is called senile emphysema. This microscopic emphysema increases linearly with increasing age in nonsmokers, but in smokers, a more progressive increase in alveolar space size can only be observed in specific (susceptible) individuals. Senile emphysema can be a consequence of the loss of the supporting structures of the lung parenchyma. Moreover, it has been observed that the elasticity of the lungs decreases with age. It has been postulated that this phenomenon is due more to the reduced surface tension force of the alveoli due to an increase in the size of the individual diameter compared to changes in elastin and collagen in the pulmonary parenchyma.[53]

Body mass index is often defined as body weight (kilograms) divided by height (meters) squared (kg/m^2). BMI is related to body fat, which can categorize obesity and malnutrition in both adults and children. BMI is also used to assess nutritional deficiency, where a BMI<18.5 kg/m^2 indicates nutritional deficiency. Malnutrition in COPD is associated with complications and increased mortality. COPD patients with low body weight have a lower diffusion capacity and exercise than normal-weight COPD patients. Reduced body cell mass is associated with reduced diaphragm mass and respiratory muscle mass. Malnutrition is also associated with decreased immune status, so that unwanted complications can occur, such as nosocomial lung infections and hypercapnic lung failure.[54]

A limitation in this study was that this study does not assess the severity of smoking which can affect respiratory symptoms and pulmonary function disorders.[7] Examination of lung function uses a type of hand-held spirometers, a type of spirometry that was easy and affordable. However, they differ in values from more accurate spirometry types such as bellows spirometer or rolling seal.

Conclusions

The knowledge level of lung function health, there were differences in the knowledge category of risk factors for respiratory disorders, symptoms of respiratory disorders, and treatment and therapy of respiratory disorders between groups without lung function disorders and with impaired lung function. Suggestions for future research are to increase the assessment of risk factors that can affect lung function. In addition, it is necessary to carry out similar research on respondents with different characters, such as different occupations that are at risk of exposure to respiratory problems (construction workers, mining workers, parking attendants), or differences in education, gender, and e-cigarette smokers.

Conflict of Interest

All authors stated that there was no conflict of interest in this study.

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