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Relationship of Knowledge on Respiratory Disorders with Lung Function in Masons in East Surabaya

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Abstract

Masons are regularly exposed to air pollution in the workplace The pollution exposure received by them is a risk factor for respiratory problems. Most of the masons had insufficient knowledge that is very important for the management of a person's illness. The purpose of this study was to determine relationship of knowledge on respiratory disorders with lung function in masons in east surabaya. This research was an observational study with a cross-sectional design with a purposive method. The research was conducted from April to July 2019 in the East Surabaya area. The variables that will be observed in this study are the level of knowledge of risk factors, symptoms, and treatment and therapy regarding respiratory disorders. In this study, there were 158 respondents consisting of 79 groups with impaired lung function and 79 groups without lung function disorders. Most of the level of knowledge of both groups was good in risk factors and treatment of respiratory disease, but instead on the symptoms regarding respiratory disease. The research showed that there was a relationship between the level of knowledge about risk factors for respiratory disease ($p(0.223)<0.05$) and lung function, but there was no difference in knowledge about symptoms ($p(0.745)<0.05$) and treatment ($p(0.741)<0.05$) respiratory disease with pulmonary function. Therefore, it was necessary to plan further educational programs in increasing masons' knowledge of respiratory symptoms so that they could catch respiratory diseases earlier.

Keywords: knowledge, lung function, masons, respiratory disorders

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1 Introduction

Surabaya is the second metropolitan city in Indonesia with a total area of 326.36 km^2. In 2017 the city of Surabaya has a population of 2.87 million and is predicted to increase every year [1]. The efforts of the Surabaya City government in realizing development planning require labor, one of which is a builder. A builder is a person who works by relying on his physical strength and has skills in handwork (digger, bricklayer, blacksmith, carpenter, painter) in making buildings in general (such as buildings, houses, shops) [2]. Masons have a very high risk of being exposed to air pollution [3,4]. According to research data in 2010, more than 50% of masons are regularly exposed to air pollution such as steam, gas, dust, or smoke in the workplace [5].

The pollution exposure received by masons is a risk factor for respiratory problems [6]. A work environment full of air pollution will have a negative impact on lung health [7]. Air pollution can have a direct or indirect effect on environmental quality degradation, namely air pollution [4,8]. The impact of air pollutants on the respiratory system has been consistently reported in recent years. Adverse effects include decreased lung function, increased infection, increased respiratory symptoms, acute exacerbations, onset of asthma, and increased respiratory mortality [6].

Decreased lung function in the form of respiratory disorders that occur in the respiratory tract and lungs that affect the human respiratory system [10]. Respiratory disorders can also be seen from spirometry measurements by looking at the FEV1/FVC value, where if the FEV1/FVC (Forced Expiratory Volume 1/ Forced Vital Capacity) value is <0.7 then it can be stated that you have respiratory problems [11]. In 2017, respiratory system diseases were also included in the top 10 most diseases in Surabaya and even ranked first [12]. Most of the masons had insufficient knowledge. Based on the results of the study, where most of the mason respondents were at the elementary education level and dropped out of school [13]. Lack of knowledge can affect the prevention of respiratory disorders. According to research conducted by Bhandari et al., it shows that 88.0% of respondents have a below-average level of knowledge to prevent respiratory problems. Likewise, 41.0% of respondents had an average level of knowledge regarding the prevention of respiratory problems [14]. Knowledge of respiratory health shows that 65% of people have insufficient knowledge, 35% of people have moderate knowledge and no one has sufficient knowledge [15].

Knowledge is very important for the management of a person's illness, self-management in order to avoid a disease [16,17]. According to research, if a person has more knowledge of the disease, it is more likely that someone will obey the treatment [18]. Therefore, pharmacists are required to provide good health services to patients and pharmacists must have knowledge, skills and behavior that are always improved [19]. The purpose of this study was to determine differences in knowledge regarding (1) risk factors for respiratory disorders; (2) respiratory symptoms; and (3) treatment and therapy of respiratory disorders in masons with impaired lung function and without pulmonary function disorders.

2 Materials and Methods

2.1 Research design

The research was conducted from April to July 2019 in the East Surabaya area. This study was an observational study using a cross sectional study design to determine the profile of knowledge about respiratory disorders in builders based on lung function. Retrieval of research data by means of direct question and answer (interview) between the interviewer and the respondent.

2.2 Research variable

This study has two variables, namely the independent variable and the dependent variable. The independent variable of this study was impaired lung function. While the dependent variable in this study was the level of knowledge related to respiratory disorders.

The builder referred to in this research was a person who works by relying on his physical strength and has skill in a handwork (digger, bricklayer, bricklayer, carpenter, painter) in making buildings (such as buildings, houses, shops). Lung function disorders were diseases and disorders that occur in the respiratory tract and lungs that affect human respiration [10]. A person's lung function can be known through spirometric measurements, if the measurement using spirometry shows the results of the FEV1 value <70%, it can be said that you have lung function disorders [20]. The knowledge referred to in this research was knowledge about risk factors, symptoms, and treatment and therapy that the respondent has regarding respiratory disorders.

2.3 Population and Research Sample

The population in this study were masons who were working on a project or were active in the East Surabaya area. The sample in this study were masons who were in the East Surabaya area who were included in the inclusion and exclusion criteria. Respondents who are willing to participate in this research and have filled in the informed consent, are male, b. Age 17 - 65 years, active smokers, minimum length of work for 5 years, and no mental or physical disorders. The sampling technique used was random sampling (nonprobability sampling) with purposive sampling and consecutive sampling methods. The number of samples taken in this study using the Lemeshow formula with an unknown or infinite population. The following is the formula used: $\mathbf{n=Z^2[P(1-P)]/d^2}$ (n= number of samples; Z=standard normal value (if $\alpha = 0.05$ then Z = 1.960); P(1-P)=estimated population proportion (if P=0.1 then P(1-P)=0.09); d^2: tolerant deviation (10%)). So the minimum number of samples needed in this study is 62 respondents for each group.

2.4 Method of collecting data

Respondents will be given a questionnaire which was one of the instruments, important in research, the questionnaire given was about knowledge related to respiratory disorders. The questionnaire in this study consisted of 25 questions, of which 11 questions about knowledge of risk factors for respiratory disorders, 6 questions about knowledge of respiratory symptoms, and 8 questions about knowledge about treatment and therapy.

Pulmonary function measurements were carried out using a Handled Spirometer where BMI data in the form of body weight and height as well as respondent data such as gender, age, smokers or non-smokers were also entered into the spirometer. The results of the spirometer measurement are used to determine respondents who have respiratory problems or do not experience respiratory problems based on FEV1, if FEV1 <70% indicates respiratory problems [20]. So if FEV1 <70% it can categorized in the group that has impaired lung function and if FEV1>70% can be categorized in the group that does not experience lung function disorders.

2.5 Data analysis method

Data processing was carried out in stages, starting with the data collected in the field until the data was ready for analysis. The data that has been collected in the field was checked, if there was a lack of data, it will be supplemented with repeated interviews with research respondents. The answers from the respondents will be coded to make the data input process easier. Then the data were analyzed descriptively (minimum, maximum, average and standard deviation values) and statistically using SPSS version 24 software.

The expected value in the chi-square should not be less than 5 (maximum 20% of expected frequencies <5). If the expected value was not met (20% expected frequencies <5), then the chi-square must be replaced with an alternative test and in determining the P value, if the P value was greater than 0.05 then there was no significant difference, but if the P value was more smaller than 0.05, there was a significant difference.

The level of knowledge of risk factors for respiratory disorders was measured using a questionnaire about respiratory disorders in which there were 11 questions. Every question that was answered correctly will be given a score of 1, while questions that are answered incorrectly or don't know will be given a score of 0. Then the level of knowledge will be classified as good and bad. It was said to be good if it gets a score of ≥8 and it is said to be bad if it gets a score of <8. Then the chi-square test was carried out and the P_{value} was obtained of 0.223, which means that there was no significant difference between the group with pulmonary function disorders and the group without lung function disorders.

The level of knowledge of respiratory symptoms was measured using a questionnaire about respiratory disorders in which there are 6 questions. Every question that was answered correctly will be given a score of 1, while questions that were answered incorrectly or don't know will be given a score of 0. Then the level of knowledge will be classified as good and bad. It was said to be good if it gets a score of ≥ 4 and it was said to be bad if it gets a score of <4. Then performed the chi-square test and obtained a P_{value} of 0.745 which means none a significant difference between the group with impaired lung function and the group without pulmonary function impairment.

The level of knowledge of respiratory symptoms was measured using a questionnaire about respiratory disorders in which there were 8 questions. Every question that was answered correctly will be given a score of 1, while questions that were answered incorrectly or don't know will be given a score of 0. Then the level of knowledge will be classified as good and bad. It was said good if it gets a score of ≥ 6 and it was said to be bad if it gets a score <6. Then the chi-square test is carried out and the P_{value} was obtained of 0.741 which means no a significant difference between the group with impaired lung function and the group without pulmonary function impairment.

3 Results and Discussion

This research was conducted in April-July 2019 by conducting direct interviews with respondents using a questionnaire about respiratory disorders to determine the knowledge profile of risk factors, symptoms, and treatment and therapy for respiratory disorders based on lung function in masons in East Surabaya. Respondent data obtained in this study were 158 masons consisting of 79 people with pulmonary function disorders and 79 people without pulmonary function disorders. There were 20 respondents who refused to fill out the questionnaire, where 16 people did not want their rest time to be disturbed and 4 people did not meet the criteria.

3.1 Validity and Reliability of the Questionnaire

The results of the validity test of the risk factor knowledge questionnaire were declared valid. The questionnaire can be said to be valid if $r_{count} > r_{table}$ product moment, where the value of r_{table} for 30 respondents was 0.361 and all question items from the questionnaire have a value greater than the value of r_{table} product moment. The results of the reliability test of the risk factor knowledge questionnaire were declared reliable because they had a Cronbach's Alpha value equal to or greater than 0.61 (Cronbach's Alpha ≥ 0.61). The results of the reliability test of the risk factor knowledge questionnaire that have been obtained are declared reliable. The results of the validity of the questionnaire for knowledge of respiratory symptoms were declared valid because the value of $r_{count} > r_{table}$. Then then the questionnaire will be tested for reliability. The results of the questionnaire reliability test were declared reliable because Cronbach's Alpha value was ≥ 0.61 (**Table 1**).

3.2 Characteristics of Research Respondents

Respondents in this study were grouped into 2 groups, namely the group without lung function disorders and the group with lung function disorders. Respondents used in both groups were 158 respondents with 79 respondents in each group. Characteristics of respondents based on age consisted of late adolescents (17-25 years), early adults (26-35 years), late adults (36-45 years), early seniors (46-55 years), and late elderly (56-65 years old). Respondents without pulmonary function disorders in late adolescence were 20 respondents, early adults 33 respondents, late adults 13 respondents, early elderly 10 respondents, and late elderly by 3 respondents. Meanwhile, respondents with lung function disorders consisted of 15 respondents as late as adolescence, 45 respondents for early adulthood, 15 respondents for late adults, 3 respondents for early elderly, and 1 respondent for late elderly. Based on the age characteristics after testing the differences in the two groups showed that there was no significant difference between the two groups (**Table 2**).

Table 1. Validity and Reliability Test

Domain	Validity Test				Reliability Test	
	No.	**Question**	***Corrected Item-Total Correlation***	**Conclusion**	**Cronbach's Alpha**	**Conclusion**
Knowledge of Risk Factors for Respiratory Disorders	1	Environments with high pollution levels have greater risk of respiratory distress	0.457	Valid	0.614	Valid
	2	The smoke from the combustion/ factory /mine is a pollution which can cause respiratory distress	0.417	Valid		
	3	Smoking is not a cause of respiratory distress	0.419	Valid		
	4	The more the number of cigarettes smoked then further increase the risk factors for the disorder respiration	0.551	Valid		
	5	People working in dusty environments not experiencing respiratory distress	0.509	Valid		
	6	People who work in industrial areas have poor lung condition due to pollution in the area industry	0.411	Valid		
	7	People living in cities are more at risk experiencing respiratory distress than staying in the village	0.503	Valid		
	8	People living in industrial areas are more risk of experiencing respiratory distress	0.411	Valid		
	9	Increasing age does not increase the risk respiratory disorders	0.539	Valid		
	10	Respiratory disorders cannot be inherited or derived from the biological family	0.400	Valid		
	11	History of respiratory disorders in infants and children can present with disabilities throughout their lifetime adult	0.374	Valid		
Knowledge of Respiratory Disorders Symptoms	1	Shortness of breath is not a symptom of the disorder inhalation	0.481	Valid	0.612	Valid
	2	Shortness of breath in respiratory disorders can getting worse when doing	0.518	Valid		
	3	Cough that is continuous/ not persistent healing is a symptom of the disorder respiration	0.564	Valid		
	4	Increased respiratory rate is common in patients with respiratory disorders	0.707	Valid		
	5	Wheezing (such as a whistling sound or a 'ngic' sound during breathing) is a symptom of respiratory distress	0.520	Valid		
	6	The respiratory rate is increased in respiratory distress not a sign of worsening condition	0.704	Valid		
Knowledge of Medicine and Respiratory Disorders Therapy	1	Cough in respiratory distress may reduce with treatment (medicine) given	0.502	Valid	0.631	Valid
	2	Treatment (medication) of respiratory disorders is given only for symptom relief	0.476	Valid		
	3	Treatment (drugs) given can cure respiratory disorders	0.722	Valid		
	4	Quitting smoking has no effect reduction of respiratory distress symptoms	0.565	Valid		
	5	Breathing exercises aim to improve effort to breathe	0.434	Valid		
	6	Quitting smoking can make you breathe for the better	0.528	Valid		
	7	Breathing muscle training is not a viable exercise reduce shortness of breath in sufferers of the disorder respiration	0.567	Valid		
	8	Body activity program (sports) for increase tolerance of physical activity	0.435	Valid		

Table 2. Respondent Characteristics Frequency Distribution

Characteristics of Respondents		Total Number of Respondents (n: 158)				Different Test	
		Group Without Lung Function Disorders (n: 79)		Group With Lung Function Disorders (n: 79)		Pvalue	Conclusion
		Frequency	Percentage (%)	Frequency	Percentage (%)		
Age (year)	Late adolescents (17-25 years)	20	25.32	15	18.99	0.113	no difference
	Early adults (26-35 years)	33	41.77	45	56.96		
	Late adults (36-45 years)	13	16.46	15	18.99		
	Early seniors (46-55 years)	10	12.66	3	3.79		
	Late elderly (56-65 years old)	3	3.79	1	1.26		
BMI (Kg/m²)	Thin (<18.5)	7	8.86	6	7.59	0.485	no difference
	Normal (18.5-25.0)	59	74.68	66	83.54		
	Overweight (25.0-27.0)	8	10.13	5	6.33		
	Obesity	5	6.33	2	2.53		
Spirometry value **[11]**	*Mild* (FEV1 >80% *predicted*)	0	0	66	83.54	-	-
	Worsening (50%<FEV1<80% *predicted*)	0	0	13	16.46		

Characteristics of respondents based on BMI were classified into 4, namely thin (<18.5), normal (18.5-25.0), overweight (25.0-27.0), and obesity (≥27.0). Respondents without pulmonary function disorders with a thin BMI were 7 respondents, normal was 59 respondents, overweight was 8 respondents, and obesity was 5 respondents. Meanwhile, 6 respondents with lung function disorders with a thin BMI, 66 normal respondents, 5 respondents with overweight, and 2 respondents with obesity. After testing the differences in the two groups, it was found that there was no significant difference in the two groups. Characteristics of respondents based on spirometric values to see lung function in groups with respiratory disorders will be classified based on GOLD [11] into 2, namely mild and worsening (**Table 2**).

Chronic lung disease was a major public health problem in the world. Although the chronic lung disease database on these outcome parameters is inadequate and often less reliable than mortality data, limited data suggest that chronic lung disease morbidity increases with age. Although the development of chronic lung disease comorbidities may occur at a younger age. Chronic lung disease was also more prevalent at age >40 years than <40 years, and was more common in men than women. Much of the increase in COPD mortality was due to the progression of the epidemic from smoking, the decrease in mortality from other common causes of death such as ischemic heart disease, infectious diseases [11]. We can broadly divide the structural changes of aging lungs into three categories:

1. Changes in the structure of the lungs. Changes in the structure of the lungs are mainly associated with an increase in the size of the alveolar spaces in the absence of inflammation or damage to the alveolar walls, which is called "senile emphysema". This microscopic emphysema increased linearly with increasing age in non-smokers, but in smokers a more progressive increase in alveolar space size can be observed in certain (susceptible) individuals only. Senile emphysema can be a consequence of the loss of the supporting structures of the lung parenchyma. In addition, 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 [21].
2. Changes in the chest wall. With increasing age, chest wall adherence progressively decreases. First, the shape of the thorax may change with age due to reduced thickness of the intervertebral discs, leading to reduced intrathoracic volume. Second, age-related osteoporosis can cause vertebral fractures, resulting in a change in the shape of the chest. Third, rib stiffness increases with age, thereby increasing the force required for chest movement [21].
3. Changes in the respiratory muscles. In general, muscle strength decreases with age. This loss of muscle strength is also reflected in

the diaphragm, the most important respiratory muscle, and thus affects the breathing pattern [21].

Malnutrition can be categorized by calculating the body mass index (BMI). BMI was often defined as body weight (kilograms) divided by height (meters) squared (kg/m^2). BMI is related to body fat which can be used to categorize obesity and malnutrition in both adults and children. BMI is also used to assess nutritional deficiencies, where a BMI <18.5 kg / m2 indicates nutritional deficiency [22]. Malnutrition was a common and serious problem in chronic lung disease patients, as COPD (chronic obstructive pulmonary disease) especially those with emphysema. COPD patients with emphysema have a lower body mass index (BMI) than COPD patients with chronic bronchitis [23,24,25]. Malnutrition in COPD was 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 was associated with reduced diaphragm mass and respiratory muscle mass. Malnutrition is also associated with decreased immune status, resulting in unwanted complications, such as nosocomial lung infections and hypercapnic lung failure [26].

The spirometric value that has been obtained from each respondent will be calculated the predictive value by comparing the spirometric value of each respondent with the normal FEV1 value, which was 3.2 liters. Then get the predicted value of each respondent, then classified. In this characteristic, the chi-square test cannot be carried out because data was not obtained in the group without lung function disorders, so that it cannot be compared between the group without pulmonary function disorders and the group with lung function disorders. Average value data in the group without lung function disorders was 77.51, the highest value was 117, the lowest value was 70, the standard deviation was 7.19, while the average value in the group with pulmonary function disorders of 63.42, the highest value of 69, the lowest value of 37, the standard deviation was 6.32.

3.3 Research Results Knowledge

At the level of knowledge of risk factors for respiratory disorders, the two groups are mostly at a good level, and there are differences in the level of knowledge of risk factors for lung function disorders among respondents with and without pulmonary function disorders. At the level of knowledge of respiratory disorders symptoms, the two groups are mostly at a bad level, and there is no difference in the level of knowledge of risk factors for lung function disorders among respondents with and without pulmonary function disorders. Meanwhile, in the knowledge of medicine and respiratory disorders therapy, the two groups were mostly at a good level, and there was no difference in the level of knowledge of risk factors for lung function disorders among respondents with and without pulmonary function disorders (**Table 3**).

Table 3. Results of Knowledge of Risk Factors for Respiratory Disorders

Domain	Knowledge Level	Total Number of Respondents (n: 158)		Total	Different Test	
		Group Without Lung Function Disorders (n: 79)	Group With Lung Function Disorders (n: 79)		Pvalue	Conclusion
Knowledge of Risk Factors for Respiratory Disorders	Good	52	59	111	0.223	There was a difference in the level of knowledge of risk factors for lung function disorders among respondents with and without pulmonary function disorders
	Poor	27	20	47		
	Total	**79**	**79**	**158**		
Knowledge of Respiratory Disorders Symptoms	Good	32	30	62	0.745	there was no difference in the level of knowledge among respondents with and without pulmonary function disorders
	Poor	47	49	96		
	Total	**79**	**79**	**158**		
Knowledge of Medicine and Respiratory Disorders Therapy	Good	51	49	62	0.741	there was no difference in the level of knowledge among respondents with and without pulmonary function disorders
	Poor	28	30	96		
	Total	**79**	**79**	**158**		

The knowledge profile about the risk factors for respiratory disorders shows that there is no difference in the level of knowledge of the respondents with or without respiratory disorders. The knowledge profile about respiratory symptoms shows that there is no difference in the level of knowledge of respondents with or without respiratory disorders. And the knowledge profile about the treatment and therapy of respiratory disorders shows that there is no difference in the level of knowledge of respondents with or without respiratory disorders. Table 3 showed that there was a relationship between the level of knowledge about risk factors for respiratory disease ($p(0.223)<0.05$) and lung function, but there was no difference in knowledge about symptoms ($p(0.745)<0.05$) and treatment ($p(0.741)<0.05$) respiratory disease with pulmonary function (**Table 3**).

The lung function test was a combination of studies carried out in clinical practice to determine lung capacity and possible decrease in mechanical function of the lungs, respiratory muscles, and chest wall. In clinical guidelines, pulmonary function interpretation has historically been based on the most important anthropometric factors, including weight, height, sex, and age [27]. In Lorensia et al. [28], in 148 respondents pedicab drives as high risk chronic pulmonary disease (135 with respiratory disorder and 13 without respiratory disorder). The results of this study found the most common risk factor was air pollution exposure. In 145 respondents (97.97%), the average lung function was 52.56%. The most frequent early symptom was dyspnea with percentage of 7.43% and average lung function value of 26.20%. Air pollution was the most common risk factor and dyspnea was the most common early symptom in pedicab drivers with respiratory disorders in Surabaya.

4 Conclusions

The knowledge profile about the risk factors for respiratory disorders shows that there is no difference in the level of knowledge of the respondents with or without respiratory disorders. The knowledge profile about respiratory symptoms shows that there is no difference in the level of knowledge of respondents with or without respiratory disorders. And the knowledge profile about the treatment and therapy of respiratory disorders shows that there is no difference in the level of knowledge of respondents with or without respiratory disorders.

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6 Author Contribution

All authors contributed starting from data collection, data analysis, and writing papers.

7 Ethical Clearance

No. 002-OL/KE/IV/2019 from Health Research Ethics Committee in Universitas Surabaya.

8 Conflicts of Interest

The authors declare no conflict of interest.

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