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ANALYSIS OF COHb LEVEL IN BLOOD CONTRIBUTION ON THE LUNG FUNCTION CAPACITY TO POTTERS AT YOGYAKARTA GIWANGAN TERMINAL

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Yogyakarta is a capital city of Daerah Istimewa Yogyakarta, educational, tourism and industry city. This condition probably makes citizen increase and it can also increase urbanization to Yogyakarta. Citizen increasing causes the vehicle volume increased and it can make quality of air decrease. Main source of pollutant comes from transportation and one of them is carbon monoxide. Potter in Giwangan terminal were respondents in this study which were in high risk to be exposed by transportation emission which had carbon monoxide because their activity that always stay in terminal for long time. This study aim was prevent risk of lung capacity decreasing caused by carbon monoxide to potters at Yogyakarta Giwangan terminal. This study was observational study with cross sectional design. Study Population was all potters at Yogyakarta Giwangan terminal with sample large were 33 samples (population total). Data analysis used spearman correlation test and fisher's continued logistic regression. The results of this study showed that 30.3% of respondents had the abnormal lung function capacity (lung problems) and 69.7% of respondents had normal lung function capacity. The results of bivariate analysis between age, nutritional status, use of Personal Protection Equipment (PPE) and disease history were not associated with lung function capacity (p-value> 0.05) and there was associated between the period of employment, smoking habit, and exercise habits with a capacity of lung function (p-value <0.05). Multivariate test results indicated that COHb levels did not contribute to the capacity of lung function and smoking was the most influencing variable to capacity of lung function with odds ratio value (OR) as many as 16.37. COHb levels did not contribute the capacity of lung function and smoking habit was the most factors which influence than others.

Keywords: Carbon Monoxide, Lung Function Capacity, Air Pollution

1. INTRODUCTION

Population growth in Indonesia is continuously increasing every year as well as the number of transportation. Along with the increasing human population and the number of transport then it will lead to the emergence of problems such as congestion, irregular traffic and decrease of air quality (air pollution). Globally, air pollution kills up to 2.4 million people a year worldwide. Most of the deaths from air pollution occur in east Asia and India where the air pollution there has been heavy. The empirically estimated that as many as 1.24 million people in East Asia and India as many as 549,000 people died from inhaling toxic air every year. Europe and Southeast Asia, particularly Indonesia has a high mortality rate as well. Based on data from the WHO showed that mortality due to outdoor air pollution in 2008 in the southeast Asian region, Indonesia was the third country after India and Bangladesh. Major deaths caused by outdoor air pollution were disturbance

of the respiratory system that was 88.3% in the causes of cardiopulmonary disease, lung cancer 11% and 0.7% respiratory infection.

Yogyakarta is a capital city of Daerah Istimewa Yogyakarta, educational, tourism and industry city. This condition probably makes citizen increase and it can also increase urbanization to Yogyakarta. Citizen increasing causes the vehicle volume increased and it can make quality of air decrease. Based on the summary data of Traffic Directorate of Yogyakarta Local Police almost all of vehicles types such as passenger cars, buses, freight cars, motorcycles and specialty vehicles each year continues to increase, which in 2010 was 1,488,522 units and in 2011 has reached 1,618,457 units. The number of vehicles was caused new comers who came for studying or trading activity.

Groups of workers who have a high risk at the Giwangan Terminal among those with stable moving and working around there such as porters there, they are vulnerable to have respiratory disorder because of carbon monoxide contamination. Porters usually take up passangers' goods directly from the passengers off the bus and deliver the goods to the destination, unlike rider of motorcycle taxi and taxi drivers who have relatively sedentary jobs. Based on the above it is necessary to research on the effects of carbon monoxide on lung function in the capacity of the community, especially high-risk groups such as porters at Giwangan Terminal in Yogyakarta.

2. MATERIAL AND METHODS

This research was an observational study, with a cross-sectional approachment. This research was conducted at Giwangan Terminal in Yogyakarta. The study population was all male potters. The sample size in this study was 33 people (population total) with the inclusion criteria were willing to take a blood sample, and the work was mostly done outdoors.The variables in this study consisted of dependent variable, independent variables. Dependent variable was the capacity of lung function, levels of COHb, age, nutritional status, length of work, smoking habits, exercise habits, PPE Using and history of lung disease as the independent variable.

The instrument used in this study was a spirometer to measure lung function capacity, spectrophotometry to quantify and measure the spectrum of light wavelengths, syringes to take blood samples, microtoise to measure height and weight scales to measure. Questionnaire was to determine the characteristics of the respondents such as age, nutritional status, length of employment, smoking habits, exercise habits, PPE using and exercise habits.

Analysis of the data in this study consisted of univariate, bivariate and multivariate. Univariate analysis was used to see the distribution of each variable. Bivariate analysis was used to identify whether there was a correlation between two variables (dependent and independent). The statistical test used was Fisher's test and Spearman correlation test. Multivariate analysis to determine the relationship between independent variables and the most dominant variable affecting dependent variable was logistic regression.

3. RESULT AND DISCUSSION

3.1. Demographic Information

Variables measured in this study were age, nutritional status, length of work, smoking habit, smoking intensity, exercise habit, Personal Protective Equipment (PPE) use and history of lung disease. The variable descriptions were performed in table 1. Most of respondents have age more than 40 years old, normal nutritional status, less than 10 years length of work. Quarter of respondents have smoking habit with heavy smoking intensity. The percentage exercise habit was

almost the same. Almost a half of them answered 'yes' for exercise habit and others 'no'. a few of them used PPE during working and few of them have history of lung disease. More than a quarter of them have abnormal lung function capacity (table 1).

3.2. Air CO Level

Measurement of carbon monoxide levels in the air was conducted to find out the amount of carbon monoxide gas level in the air. In this study, measurement of carbon monoxide was carried out simultaneously with the blood taking of porters. The measurement was conducted at 1 point at passenger stops at some time that were morning, day and afternoon at Giwangan Terminal (figure 1). The results showed that carbon monoxide level in the air on morning was the highest than others (day and afternoon). CO levels at any time during the morning, day and noon were still eligible. it did not exceed air threshold quality standard that was 30,000 µg/m3 and the average levels of carbon monoxide (CO) at three different time were still below TVL.

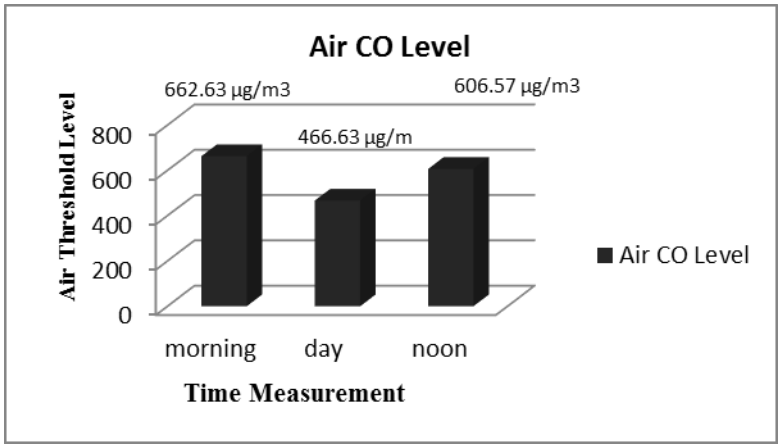

Figure 1. Air CO Level

Table 1. Characteristic of potters at Giwangan Terminal in Yogyakarta

Variable	Categories	Frequency	Percentages (%)
Age	> 40 years	26	78,8
	≤ 40 years	7	21,2
Nutritional status	Abnormal	13	39,4
	Normal	20	60,6
Length of work	> 10 years	11	33,3
	≤ 10 years	22	66,7
Smoking habit	Smoking	12	36,4
	Not smoking	21	63,6
Smoking intensity	Heavy	2	6,1
	Moderate	5	15,2
	Light	5	15,2
	Non-smoker	21	63,6
Exercise habit	Yes	16	48,5
	No	17	51,5
Exercise types	No	16	48,5
	Non Aerobic	0	0
	Aerobic	17	51,5
PPE Use	No	31	93,9
	Yes	2	6,1
History of lung disease	Yes	3	9,1
	No	30	90,9

Lung function capacity	Abnormal	10	30,3
	Normal	23	69,7

Table 2. Relationship between COHb level with lung capacity function

Variable	**Lung disorders restriction (FVC)**	***p-value***
	Correlation coeficient (r)	
COHb level	0,372	0,033

Variable	**Lung disorders obstruction (FEV1)**	***p-value***
	Correlation coeficient (r)	
COHb level	0,345	0,049

3.3. Analysis of bivariate and Multivariate

There was a significant relationship between COHb levels with FVC. Correlation coefficient 0.372, meaning that there is a very weak relationship between COHb levels with lung function capacity. The values in FEV1 shows p-value of 0.049, it means that there was a significant relationship between COHb levels with FEV1 (table 2).

Table 3. Multivariate analysis of lung function capacity

Variables	*p*	Model 1 **OR (95% CI)**	*p*	Model 2 **OR (95% CI)**	*p*	Model 3 **OR (95% CI)**
Length of work	0,199	4,769				
> 10 years		(0,440-71,469)				
≤ 10 years						
Smoking habits	0,119	7,795	0,033	11,951	0,009	16,370
Yes		(0,588-103,266)		(1,228-116,338)		(2,009-133,395)
No						
Exercise habits	0,150	6,091	0,234	3,474		
No		(0,519-71,469)		(0,448-26,962)		
Yes						
COHb level	0,082	0,334	0,068	0,347	0,063	0,362
		(0,097-1,147)		(0,111-1,082)		(0,124-1,058)
Nagelkerke R^2 (%)		0,532		0,483		0,440

Multivariate logistic regression analysis modeling shows that from four independent variables, there were one variable that had a significant relationship (smoking habits). COHb levels showed no significant association with lung function capacity, so that COHb levels do not contribute to lung function capacity. Logistic Regression Results of the modeling also shows that the last value 0.440 Nagelkerke R^2. This means that the model 3 with two variables can predict the of lung function capacity by 44% or 44% of these two variables affect lung function capacity. The most dominant factor affecting the capacity of lung function was smoking habits with OR 16.37 (CI: 2.009 to 133.395).

3.4. Correlation dependent variables and Independent variables

The results of questionnaire information includes demographic information about potters at Giwangan terminal including age, nutritional status, tenure, smoking habits, exercise habits, PPE usage habits and disease history. It also measured levels of co in the air and the blood CO level and lung function capacity.

The results of the demographic information in the questionnaire were performed statistical analysis using Fisher's test. Statistical analysis between age and lung function capacity of workers

showed that age was not statistically significant association with lung function capacity, lung function capacity categorized who has age > 40 years and ≤ 40 years is not too much different. Statistical analysis between nutritional status and lung function capacity of workers shows that nutritional status was not statistically significant association with lung function capacity. This is consistent with other studies in assessing pulmonary function impairment of the nutritional status in wood processing workers. It showed the nutritional status was not a risk factor for lung problems in workers. Statistical analysis between length of work with lung function capacity of workers indicate that the work period had had a statistically significant association with lung function capacity. The calculation of the ratio obtained prevalent RP = 3 with the CI 1.063 to 8.468 were not exceed 1, this means that respondents with length of work more than 10 years had a three times greater risk of decreased lung function capacity compared with respondents who had a working period of less than 10 years. This study confirmed other studies that states that workers who have worked more than 10 years are at risk nearly 15 times more likely to impaired lung function compared to workers whose tenure of less than 10 years.

Statistical analysis between smoking and lung function capacity of workers shows that smoking has had a statistically significant association with lung function capacity. The calculation of the ratio prevalent obtained RP = 4 with CI 1291 to 12.917 which do not exceed 1, this means that respondents who had a habit of smoking had 4 times greater risk of decreased lung function capacity compared to respondents who did not have the habit of smoking. This was similar with other studies state that workers who had a habit of smoking were at risk of pulmonary function impairment 4.75 times greater in comparison with people who did not smoke.

Statistical analysis between exercise habits with lung function capacity of workers shows that the habit of exercise is not statistically significant association with lung function capacity. The calculation of the ratio obtained prevalent RP = 4.25 CI 1.058 to 17.080 with a value that does not exceed 1, this means that respondents who did not have the habit of exercise have a 4.25 times greater risk of decreased lung function capacity compared with respondents who had a habit Sports.

Statistical analysis of the use of PPE with lung function capacity of workers shows that the use of PPE was not statistically significant association with lung function capacity. This result was similar with other studies that the use of PPE was no significant relationship with lung function capacity. Statistical analysis between history of disease with lung function capacity of workers shows that the history of the disease was not statistically significant association with lung function capacity. This result was similar with other studies in car painting workers in Semarang that there was no significant relationship between disease history with lung function capacity.

The results of the statistical analysis of the correlation test CO levels in the blood with lung function capacity there was a significant correlation between the levels of COHb with FVC. While the in FEV1 showed the p value of 0.049 means that there was a significant correlation between the levels of COHb with FEV1. The correlation coefficient 0.372 FVC and FEV1 0.345, meaning that there was a very weak correlation between the levels of COHb with lung function capacity. According to other studies that COHb concentrations may aggravate the disease of patient with history of chronic obstructive pulmonary disease (COPD), in addition COHb concentrations can also systemic inflammation and lung. Increasing concentrations of COHb associated with inflammation in the airways or lung parenchyma and airway constriction. While other studies have also suggested that the pollutant carbon monoxide affect lung function in adult subjects with asthma.

4. CONCLUSION AND RECOMMENDATION

COHb levels did not contribute to the capacity of lung function and smoking habits was factor that most affect lung function capacity with OR 16.37, this means that respondents who have a habit of smoking are at risk of 16.37 times the capacity reduction pulmonary function. We recommend that It should be held periodically checks to giwangan terminal porters in order to find out if they have been exposed to a gas vehicle that exceeds the threshold and Giwangan terminal porters should be routinely checked their lung function at the hospital. Besides that, the porters who have smoking habit shoud reduce and avoid smoking habit each day to reduce the risk of lung function disorder. And We also recommend porters to consume food containing atntioxidant like: vitamin C each day, it can protect their lung function

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