INTERNATIONAL JOURNAL
FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

The Risk Factors of Pulmonary Function Disorder of Construction Workers in Sabo Dam Kali Putih Magelang Regency, Central Java

Putri Arida[1], Onny Setiani[2], Nurjazuli[3]
[1](Master Of Student Of Environmental Helath Diponegoro University, Indonesia)
[2](Lecturer Of Master Of Environmental Health and Doctoral Studies Program Of The Faculty Of Public Health, Diponegoro University, Indonesia), [3](Lecturer Of Master Of Environmental Health and Doctoral Studies Program Of The Faculty Of Public Health, Diponegoro University, Indonesia)

Abstract: Dust exposure will cause respiratory diseases such as pneumonia, occupational asthma , chronic obstructive pulmonary disease (COPD) and indicated by decreasing of %FEV1/%FVC level .Workers who are exposed to dust have a high risk and can lead to accumulation of dust particles.The purpose of this research is to analyze the lenght of employment, Body Mass Index (BMI), and smoking habits with lung function among Sabo Dam construction workers in Kali Putih Kabupaten Magelang. This research was an observational analytical study with cross sectional design. The sample size was 54 which were taken by purposive sampling technique. Data were analyzed using statistical test Chi square (X_2). The result showed that signifikan of between lenght of employment(p value= 0,013), smoking habits(p values = 0,021) with lung function disorders. Meanwhile, bivariat analysis showed that there was no significant correlation between Body Mass Index (BMI) with pulmonary function disorders (p value = 0,236). Based on this study can be concluded that lenght of employment and smoking habits are the risk factor of lung function capacity.
Keyword: dust exposure, risk factors, pulmonary function disorder

I.   INTRODUCTION

Based on ILO data in 2011, there are 1.979.000 cases of occupational disease have been recorded and 7% of them are lung disease. In 2015, the case of occupational diseases are increasing to 2.400.000, meanwhile 17% of them are respiratory disease. A research conducted in a cement company located in Pakistan shows that the dust exposure is the strongest factor causing lung diseases to their workers.

Dust exposure on workers are affected by various sources such as temperature, humidity, or ventilation condition in their working room. According to the regulation, it is recommended that 40% - 60% of humidity in working environment. The humidity number that is not qualified can reduce the air quality and can cause pulmonary function disorders

The extreme air temperature can slowly affect the respiratory condition of someone in a short to a long period of time. A company that has a pollutant resources can affect the temperature and the humidity, therefore the workers who are inside the area.

The development area of Sabo Dam in Magelang regency is one of the development area with high dust exposure. This phenomenon comes from various construction activities that are using materials and equipment that can cause the exposure. The preliminary research result shows that from 14 workers interviewed, all of them complain about the signs of respiratory problems. Temperature measurement and humidity are above average. The average temperature in all operational areas of development are reaching 32,1°C. Meanwhile, the number of humidity measurement shows above the average in 74%. Those results can trigger the respiratory disease among the workers.Based on the data, researcher attempted to conduct a research to disclose the various factors that affect lung capacity of construction workers in Sabo Dam .

II.   METHOD

 This research was an observational analytic research with Cross Sectional study plan. The reachable populations in this research were workers who worked in the Sabo Dam Kali Putih , Salam Sub-district, Magelang Regency. The total sample used in this research were 54 respondents by using purposive sampling techniques. Inclusion subject criteria comprises of male sex, aged more than 18 years, willing to be a research subject, and not suffering from respiratory disease. The research instrument used a questionnaire that contained research questions that led to the research variables Pulmonary function measurement was carried out

using a spirometer which was conducted by the Occupational Healthy and Safety Laboratory of Special Region of Yogyakarta. The variables used in this research were the working period, BMI and smoking habits of respondents with the dependent variable was pulmonary function disorder. Data analysis techniques was using Chi Square statistical analysis. Data analysis was performed by analysing the univariate and bivariate data. Data that had been collected was processed by SPSS 22 software.

III. RESULTS

Based on the result of pulmonary function disorder, 19 or equivalent with 35,2% people had pulmonary function disorders, while 35 people remaining or 64.8% showed a normal results.

According to the table 1, the highest number of respondents are at the age 18 to 40 years with 43 people (79.6%). The respondents who are 40 years above are 11 people (20,4%).

Tabel 1 Frequency Distribution of Characteristics of Respondents by Age at Sabo Dam Kali Putih Construction Workers.

Age	N	Total (%)
18 – 40 years	43	79,6
>40 years	11	20,4

Interview result of respondent's education, showed most respondents have an education level in the high school / vocational high school level and equal to 35 people or 64.8%.

Tabel 2 Frequency Distribution of Characteristics of Respondents by level of education at Sabo Dam Kali Putih Construction Workers.

Level of Education	N	(%)
Primary school	4	7,4
Secondary school	9	16,7
High school	35	64,8
University	6	11,1

Chi square analysis results showed that 17 (48.6%) respondents who worked ≥ 3 years had experienced pulmonary function disorders. The amount of dust exposure inhaled during years of work is one of the influences of the decreased lung function.

Sabo Dam construction workers are people who have a high risk of pulmonary function disorders. This is due to the work activities from the production process of building materials, heavy equipment mobilization up to the construction project activities. Work activities that take place continuously will have an impact on the deposition of dust particles in the respiratory tract due to inhalation by workers. Inhalation of dangerous pollutant materials can cause irritation to the bronchioles. This process causes a respiratory tract obstruction and affects the vital capacity of the lungs. If the capacity of the lungs have decrease, the lung tissue and muscles function will decrease as well, the lungs are not able to expand maximally.

Tabel 3 The Analysis of Working Period with Lung Function Disorders of Sabo Dam Kali Putih Construction Workers

Working Period	Vital Lung Capacity				
	Abnormal		Normal	Total	
	n	%	%	Value	RP
Old (≥ 3 tahun)	17	48,6	18	51,4	0,013	4,614
New (< 3 tahun)	2	10,5	17	89,5		(1,191 – 17,808)

According to table 4 the results of statistical analysis show that p value is 0,236 (0,236 > 0,05). This can be concluded that BMI has no risks in lung capacity of respondents. This situation can be happen because of the average age of workers are still in the young age range, so their immune system are still good. Theoretically, the lack of nutrient intake that enters to the human body can disrupt the physiological composition of the body. If it happens continuously, the immune system will decrease and can cause a decrease in lung function.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue X, Oct 2018- Available at www.ijraset.com

Tabel 4 Pulmonary Function Disorders According to BMI of Sabo Dam Kali Putih Construction Workers

BMI	Vital Lung Capacity					
	Abnormal		Normal		Total	
	n	%	n	%	Value	RP
Abnormal	8	42,1	11	57,9	0,236	1,340
Normal	11	31,4	24	68,6		(0,653 – 2,751)

Based on interview result, there are 41 respondents who have smoking habits, meanwhile the other 13 respondents are not smoking. Based on table 5 bivariat test of smoking habits with vital lungs capacity showed p value is 0,021. Therefore, smoking habits is a protective factor in occurrence of pulmonary function disorder of respondents.

Tabel 5 Pulmonary Function Disorders According to Smoking Habits in Sabo Dam Kali Putih Construction Workers

Smoking Habits	Vital Lung Capacity					
	Abnormal		Normal		Total	
	n	%	n	%	Value	RP
Smoking	18	45,0	23	56,1	0,021	5,707
Non Smoking	1	7,7	12	92,3		(0,841 – 38,720)

IV. DISCUSSION

Based on this research, it can be concluded that respondents are in the range of 18 to 40 years with 43 total respondents. The highest level of education is from High School/Vocational High School with 35 respondents. The working period variable is at risk for pulmonary function disorder for the project workers in Sabo Dam Kali Putih in Salam Sub-district, Magelang Regency with a p value of 0.013. Ratio Prevalence is 4,614 so it can be concluded that respondents who have a long working period or equivalent with 3 years are 4,614 timest risk of pulmonary function disorder compare with construction workers who recently work under 3 years. BMI variable has no risk of being the cause factor of pulmonary function disorder of the workers. P value of BMI variable is 0,236 with ratio prevalence and 95% confident interval is on the 0,653 – 2,751, thus it can be concluded that BMI is a protective factor. The research result has no correlation with the existing theory that the lack of nutritional value enters the body continuously will disturb human physiological composition which can automatically affect lung capacity. Vital lung capacity can be decreased due to fat accumulation in the abdominal muscles located next to the diaphragm. So if the diaphragm is depressed due to the accumulation of fat, the lungs will not expand maximally. Based on the result of statistical analysis shows that smoking habits are one of the protective factors of pulmonary lungs disorder. It is due to the value of confident interval reaches 0,841 – 38,720. Smoking habits can change the human respiratory function up to damage the alveoli and inflammation of cells in the lung tissues. These changes can result in clinical abnormalities until the persistent obstruction. Cigarette smoke causes damage to lung defences. The cilia movement will slow down so that the longer it will become paralyzed. In smokers, the large respiratory of mucosal cells can enlarge and mucus glands increase. Meanwhile, in small respiratory tract can occur mucus build up caused by narrowing of the respiratory tract caused by cigarette smoke and dust of the work environment.

V. CONCLUSION

This research showed that the working period variable was a risk factor and smoking habits were a protective factor of pulmonary function disorder. Meanwhile, BMI variable did not prove to be the risk factor of pulmonary function disorder. It is necessary to install local exhauster ventilation in the controlling and administration section that aims to suck the dusty air, thus it can flow out of the workplace.

VI. ACKNOWLEDMENTS

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