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Effect Of Endotoxin Levels Lipopolysaccharide (Lps) In Wood Dust Against Increased Levels Of C-Reactive Proteinand Decreasing The Lung Function Sawmill Workers In Factory Mojoagungjombang

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Abstract:- Wood dust contained endotoxin LPS can cause respiratory tract inflammation, decreased lung function and pneumonitis. This study aims to analyze the effect of endotoxin levels to elevated levels of serum C-RP and a decrease in pulmonary function sawmill workers. Analytic observational research methodology to design a prospective longitudinal study.The study sample as many as 12 workers in the factory Sawmill MojoagungJombang.Data collection techniques with interviews, personal dust measurements, personal endotoxin measurements, blood sampling, and spirometry. C-RP serum and lung function were measured before and after work. The dependent variable in this study is the serum levels of C-RP blood and pulmonary function. While the independent variable is the level of personal endotoxin. Age, years of service, and the habit of smoking is a confounding variable. Result: The average age of 40 years, 21-year working period, 75% light smokers. After 8 hours the average levels of personal wood dust was 0.53 mg / m^3 and personal endotoxin levels by an average of 55.50 EU / m^3. Workers who have increased C-RP as much (41.67%), with an average of 0.1192 mg / L. Workers who experience a decrease in FVC as much (58.33%) and FEV_1 decline as much (75%). Test results using Multiple Regression, there is no influence of the personal endotoxin levels with elevated levels of serum C-RP and decreased lung function ($p > 0.05$). Conclusion: Endotoxin LPS in a sawmill dust does not affect the increased levels of C-RP blood serum and lung function decline in workers.

Keywords:- wood dust, endotoxin LPS, lung function, C -Reactive Protein(C-RP), wood workers

I. INTRODUCTION

Occupational and environmental lung diseases are expected to increase along with the development of industrialization and modernization in the whole world. Industrialization and modernization contribute to increased pollutant materials and other hazardous materials, which can be inhaled into the respiratory tract and lungs both for workers and the public environment (Iksanet al., 2009) [1] Kauppinenet al., (2006) [2] states in 2000-2003 estimated that 3.6 million workers 2% of the working population of European Union (EU-25) exposed via inhalation of wood dust.

Inhaled wood dust will settle in various parts of the respiratory organs depends on the type of particle, the length of time of exposure, particle size and concentration of pollutant (Soeripto, 2008) [3]. Threshold Limit Values (TLV) for hardwood dust has been determined by the Minister of Manpower and Transmigration No.Per.13 / Men / X / 2011 on the Threshold Limit Value (TLV) Physical and Chemical Factors in the Workplace by 1 mg / m^3 for 8 hours per day or 40 hours per week. Examination of lung function play a role in supporting the diagnosis of obstructive lung disease, know the course of the disease and determine the prognosis of the disease (Alsagaff and Mukti, 2010) [4].

According Mandryket al., (2000) [5] is not only the health effects caused by wood dust alone but there are other agents that exist in the presence of wood dust endotoxin. Bacterial endotoxins potentially inflammatory reaction (Gordon, 1992)[6]. Epidemiological studies the presence of endotoxins in the dust of wood, among Ronggoet al., (2004) [7] show wood dust and endotoxin exposure in wood industry workers was 3.3 mg / m^3 and 91 EU / m^3.Douweset al., (2000) [8] found wood dust and endotoxin exposure in the sawmill industry average of 588 EU / m^3-7m/m^3.Health effects due to endotoxin can be acute and chronic.

Epidemiological studies in humans after inhalation exposure to endotoxin through whom Michel et al., (1997) [9] and Thorn (2001) [10] states in healthy subjects exposed to endotoxin through inhalation with different doses involving inflammatory cells, respiratory epithelial cells and the release of certain cytokines decrease airflow associated with neutrophil alveolitis, an increase in certain cytokines such as serum C-RP with the following results: at <0.5 mg did not result in acute response, 0.5 mg led to changes in blood

polymorphonuclear neutrophils (PMN), 5 mg increase in C- Reactive Protein (C-RP), and 50 mg cause clinical symptoms (ie fever) and changes in lung function. Pipinicet al., (2010) [11] found levels of endotoxin in the respirable dust sawmill at 125 EU / m ^{3} and is considered harmful to the respiratory system. Wang et al., (2005) [12] stated that long-term exposure to endotoxin (20 years) can cause a chronic decline in lung function.

Endotoxin is a lipopolysaccharide (LPS) found in the outer membrane of Gram-negative bacteria. During inflammation, endotoxin stimulates macrophages to release proinflammatory cytokines and C-reactive protein (C-RP). C-RP is an acute phase protein that is formed in the liver (hepatocyte cells) as a result of an acute inflammatory process or infection (Baratawidjaya and Rengganis, 2012) [13] Patterson and Higginbotham (1965) [14] and Larrsonet al., (1994) [15] stated that in experiments with mice injected with endotoxin of 100 mcg or inhaled by humans, with levels of 3 mg, levels of C-RP was detected in 6 hours and reached a peak in 24 hours.

Sawmill Factory in Jombang classified primary processing plants that utilize roundwood material to be processed into sawn timber and further utilized in other factories. Based on the initial dust measurements showed that wood dust in the mill average of 3.31 mg / m $^{3.}$ The results of these measurements exceeds the NAV by the Minister of Manpower and Transmigration No.Per.13 / Men / X / 2011 on the Threshold Limit Value (TLV) Physical and Chemical Factors in the Workplace by 1 mg / m ^{3} for 8 hours per day or 40 hours per week. During the entire process of sawmill workers in factories no use of personal protective equipment (PPE). This could potentially cause symptoms of respiratory complaints experienced by workers cough, phlegm, and tightness caused by inhaling wood dust in the workplace.

This study aims to analyze the effect of LPS endotoxin in the dust timber to elevated levels of C-RP and a decrease in pulmonary function of workers in the factory Sawmill MojoagungJombang.

II. MATERIALS AND METHODS

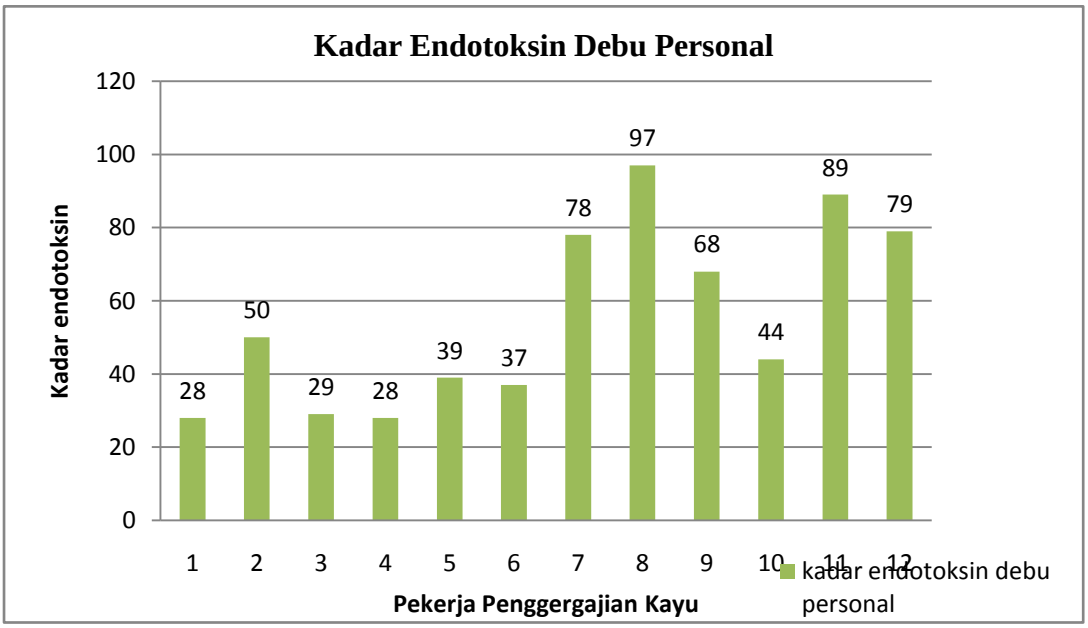
This research included observasinal analytic research, when viewed from the approach time study is a prospective longitudinal study. As the population in this study were all sawmill workers in factory Sawing Mojoagung, Jombang. Samples were taken at random (simple random sampling) and the sample size of12 research workers.

Methods of data collection personal wood dust using personal dust samplers were measured for 8 hours of work (cross-shift) and weighed using a gravimeter, endotoxin in the dust timber is obtained through indirect ELISA technique using the Limulus AmebocyteLysat (LAL). Levels of C-RP is obtained by taking blood respondent then centrifuged for serum taken, and examined with a fluorescence immunoassay technique I-CHROMA ^{TM} Reader. Spirometer is used to measure lung function. Measurement of serum levels of C-RP blood and pulmonary function of workers before and after work. Data collection age, years of service and smoking habits were obtained through questionnaire. Data were analyzed using descriptive and inferential techniques Multiple Regression.

III. RESULTSANDDISCUSSION

III.1 Levels of Endotoxin Personal

Figure 1 Levels of Endotoxin LPS Personal Dust Factory Wood Sawmill MojoagungJombang 2014.



In Figure 1 shows the levels of endotoxin LPS in wood dust at each sawmill workers an average of 55.50 EU/$m^{3,}$ the lowest value 28 EU/m^3 and the highest 97 EU/m^3.However, as much as 50% in the size 20-49 EU/m^3.

III.2 Levels of C-RP

Figure 2 Levels of C-RP Labor Before And After Working in factory Sawmill MojoagungJombang 2014.

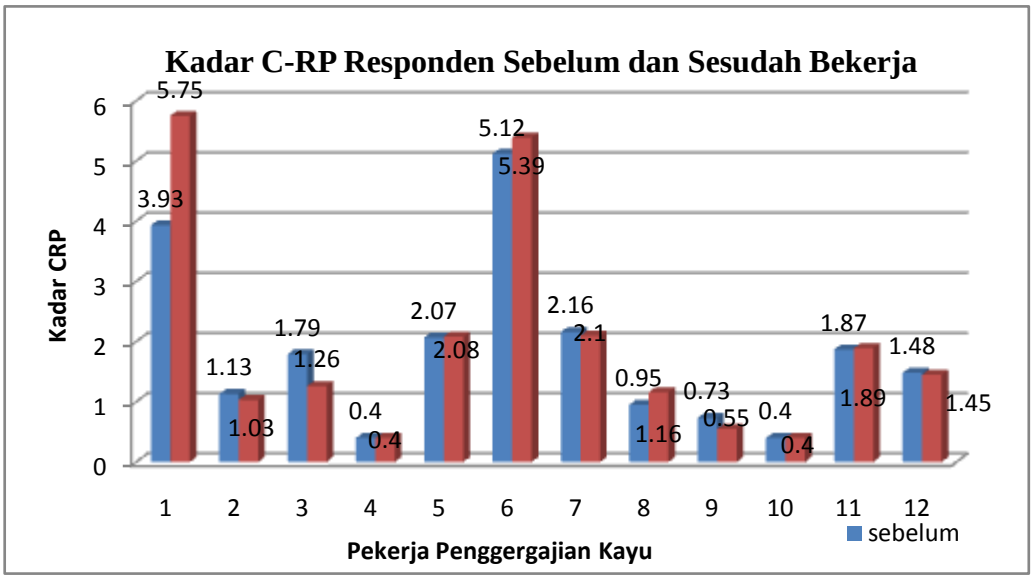


Figure 2 shows that after working for 8 hours in the sawmills, the average levels of C-RP was 0.1192 mg / L. Most of the 50% of workers had increased C-RP.

The results of the study (Figure 1 and 2) shows the average endotoxin levels of 5.6 ng/m^3 and the average levels of C-RP was 0.1192 mg / L. Based on multiple regression analysis, endotoxin had no effect on the C-RP (p> 0.05) (tabel 2).

Research Patterson and Higginbotham (1965) and Larrsonet al., (1994) stated that in experiments with mice injected with endotoxin of 100 mcg or inhaled by humans with levels of 3 mg, levels of C-RP was detected in 6 hours and reached peak within 24 hours.

This is in contrast to the experiments by Kuswantoroet al., (2009) [16] using experimental animals were exposed for 1 mg endotoxin in normal mice showed that epithelial cells bronkhiolus still in good condition and normal epithelial cells which are still compact cylindrical shape and arrangement of the ciliated epithelial cells form a complete sequence. While asthma in mice exposed to LPS in the epithelium suffered severe damage and loss of epithelial cells and cilia were irregular.

III.3 Pulmonary Function

Table 1 Distribution Index Δ FVC and FEV $_1$ Sawmill Workers in factory Sawmill MojoagungJombang 2014

Criteria Index	Δ FVC		Δ FEV $_1$	
	N	%	N	%
Increased	5	41.67	3	25
Decreased	7	58.33	9	75
Total	12	100	12	100
Mean / SD	-0.0525 / 0.19429		-0.1233 / 0.24355	
Minimum / Maximum	-0.44 / 12:18		-0.78 / 0.14	

Δ : difference

Early studies mostly sawmill workers normal pulmonary function category (58.34%), restriction (25%) and obstruction and restriction (16.66%). Based on multiple regression analysis, endotoxin had no effect on pulmonary function (tabel 2). Internationally there is no threshold limit value (TLV) or occupational exposure limit (OEL) for endotoxin. DECOS (2010) [17] states that endotoxin exposure limits in the workplace by 9 ng/m^3 (equivalent of 90 EU/m^3 or 1 ng equivalent of 10 EU).Rylander and Carvalheiro (2006) [18] found that endotoxin threshold effect on the disease that is 10 ng/m^3 causes inflammation of the airways that is harmful to the respiratory system.

In this study, LPS endotoxin levels in dust in sawmills are inhaled by each worker an average of 55.50 EU/m^3 or 5.6 ng/m^3. When compared with research Rylander and Carvalheiro the personal endotoxin levels in wood dust does not cause airway inflammation.

Table 2 Results of Multiple Regression Test between Variables (Personal Endotoxin levels) with Variable Depends (Δ C-RP, Δ FVC, FEV $_1$ Δ) At Sawmill Workers In Factory MojoagungJombang 2014.

	Δ C-RP	Δ FVC	Δ FEV $_1$
Endotoxin levels Personal	**0.789**	**0.125**	**0.298**

*** P <0.05 (significant)**

IV. CONCLUSION

Conclusion: Endotoxin LPS in a sawmill dust has no effect the elevated levels of serum C-RP and decreased pulmonary function of workers.

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