



Factors That Are Related To Bronchitis In Employees In The Cement Warehouse Unit Ambon City

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ABSTRACT

Respiratory system disorders are a major cause of morbidity and mortality. Respiratory system disorders include infectious and non-communicable diseases. Acute bronchiolitis is inflammation of the bronchioles which is characterized by shortness of breath, wheezing, and pulmonary hyperinflation. Cement dust is one of the factors causing Chronic Obstructive Pulmonary Disease (COPD) that enters through breathing (inhalation). There are 2 types of Chronic Obstructive Pulmonary Disease caused by exposure to cement dust namely, chronic bronchitis and emphysema.

Cross sectional, which is a study to study the dynamics of correlation between risk factors and impacts or

effects, by observing or collecting data at the same time (point time approach). In this cross sectional study the researcher wanted to find out the relationship between risk factors and effects or effects by taking a momentary measurement. Thus a cross sectional study is to assess risk factors in the event of an effect. Measurement of independent variables and dependent variables is done only once, namely at the same time

The average age of UPS employees PT. Semen Tonasa Gudang Arang Ambon City year 2020 is 36.1 years with the youngest age is 20 years and the oldest age is 53 years, Minimum respondent's service period is 1 year and maximum is 9 years, with a minimum length of work kerja 8 hours of work and a maximum of 10 hours of work . For the average respondent's body height is 61.5 kg, with a minimum of 47 kg and a maximum of 83 kg, while for the average body weight of the respondent is 162.9 cm with a maximum of 145 and a maximum of 173 cm.

The results of the measurement of cement dust levels above show that: 38 employees (95%) work in work areas that have a dust content > NAB, ie in Production 1 there are 19 people (47.5%) with cement dust levels of 7.58 mg / m³ , Production area 2 there are 19 employees (47.5%) with cement dust content of 7.25 mg / m³, while in the parking lot there are 2 employees namely 2 security (5%) who work with dust content <NAV ie 3, 87 mg / m³. Based on the measurement results, it is known that in the work area of production 1, and production 2 has a dust content of cement > NAV and has the potential to cause lung function disorders resulting in bronchitis.

Keywords: Bronchitis, Chronic Obstructive Pulmonary Disease

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INTRODUCTION

Acute bronchiolitis is inflammation of the bronchioles which is characterized by shortness of breath, wheezing, and pulmonary hyperinflation. Acute bronchiolitis is a low-grade acute respiratory infection (IRA-B) that is common in infants. About 20% of children have experienced one episode of IRA-B by wheezing in the first year. The annual IRA-B inpatient rate ranges from 50,000 to 80,000 infants, about 2 deaths per 100,000 babies. Acute bronchiolitis is seasonal, generally occurs at the age of less than 2 years with a peak incidence at the age of the first 6 months and more often in men. Patients with severe acute bronchiolitis have a risk of recurrent wheezing or asthma. It is not yet clear whether predisposition to asthma is also a risk factor for bronchiolitis or whether a viral infection is involved in the appearance of asthma. Some studies have found an association between asthma at first degree relative with severe acute bronchiolitis at an early age. Other studies have found that cigarette smoke exposure is a risk factor for IRA-B, in addition there are several other factors thought to be related to acute bronchiolitis including mechanical factors (airway diameter) and home density (number of households) ([http // www.paediatrics .org.nz](http://www.paediatrics.org.nz)).

Respiratory system disorders are a major cause of morbidity and mortality. Respiratory system disorders include infectious and non-communicable diseases. Chronic respiratory diseases, such as asthma, chronic obstructive pulmonary disease, pulmonary hypertension, and occupational pulmonary disease are conditions that place a heavy burden on all sufferers. Approximately 17.4 percent of all deaths in the world are the result of chronic respiratory disease. Based on the 2013 Basic Health Research report, the prevalence of respiratory diseases included in the non-communicable diseases group in Indonesia was 8.2 percent, while the prevalence of respiratory diseases including infectious diseases in Indonesia was 27.2 percent ([http: //u.lipi.go .id / 1534751244](http://u.lipi.go.id/1534751244)). The World Health Organization (WHO) estimates the incidence of respiratory infections in developing countries with a mortality rate of 15 percent -20 percent per year in toddlers. In Indonesia, respiratory infections always rank first cause of death in infants and toddlers. Based on the prevalence of respiratory infections in 2016 in Indonesia has reached 25 percent with a range of events that is around 17.5 percent-41.4 percent with 16 provinces of which have a prevalence above the national rate. In addition, respiratory tract infections are also often in the list of 10 most diseases in the hospital. In addition to infections of the respiratory tract, other disorders that occur in the respiratory tract are asthma (<http://u.lipi.go.id/1534751244>).

Cement dust is one of the factors causing Chronic Obstructive Pulmonary Disease that enters through breathing (inhalation). There are 2 types of Chronic Obstructive Pulmonary Disease caused by exposure to cement dust namely, chronic bronchitis and emphysema. Chronic bronchitis is an inflammation of the walls of the respiratory tract that can cause the respiratory tract to become slimy and narrowed so that it can affect the rate of air exchange and emphysema is an pulmonary



anatomic disorder characterized by widening of the bronchial air cavity accompanied by damage to the alveoli wall. In general, people or people who are more than 40 years old will be susceptible to chronic obstructive pulmonary disease causing impaired lung function (Baccarelli, 2014).

In industrial processes, the most important exposure pathway is the entry of chemicals dust cement into the body to produce adverse effects inhalation and skin contact. Cement dust is a gray powder made from contaminated clay and limestone and has a diameter ranging from 0.05 to 5.0 μm consisting of 60% - 70% calcium oxide (CaO), 17% - 25% silicon dioxide (SiO₂), 3% -5% aluminum oxide (Al₂O₃), potassium chromium, sodium sulfur and magnesium oxide with small amounts of iron oxide are the primary importance in the cement industry. These compounds, especially aluminum and chromium are considered toxic (Candra, Widodo, and Suwanto, 2007). So, chronic exposure to these pollutants can increase lipid membrane per-oxidation in different tissues resulting in neurotoxicity, kidney failure and anemia. Workers' exposure to cement dust (silicate) has been reported to cause respiratory disease, laryngeal cancer, gastrointestinal tumors, toxic effects on vital organs such as breathing, kidneys and liver (Zelege, Moen, and Bratveit, 2010).

In industrial environments, inhalation and skin contact with other environmental stimulation factors such as antioxidants cause unexpected hazards in the biology of systems, tissues and organs. Many articles on the harmful effects of cement dust (silicates) have been reported to cause lung laryngeal cancer, skin allergy, gastrointestinal tumors, respiratory diseases and lung disorders that do not function properly exposure to cement dust on workers in an industry can cause toxic effects on vital organs such as breathing, kidney and liver through direct contact with free radicals, especially reactive oxygen species (ROS) that lead to damaged cell membranes in the lungs (Parwati, 2015).

In Ambon City, the 10 most diseases obtained from community Health centers in Ambon City in 2018, other acute infectious diseases in the upper respiratory tract still ranked at the top or 46,307 or 38.46% followed by other diseases in the respiratory tract, the same as previous years. For other diseases by looking into the previous year, there is a change in the pattern of the disease. Prominent diseases in 2018 can be stated as infectious diseases that are still high. For productive age groups, illness greatly affects productivity and family income, so that efforts are needed by the government and the community to further enhance preventive and promotive efforts (Ambon City Health Office, 2018).

Cement Carrying Unit of PT. Semen Tonasa in the Gudang Arang area is the largest cement supplier and supplier in Maluku and is a potential hazard contained in dust. This Cement Management Unit has 30 permanent employees and $\pm$ 60 freelancers who work for 8 hours every day, so there is a great risk of disruption in the comfort of working to transport cement from the



storage warehouse to the transport and feel they have a disruption to the respiratory tract when finished working, the capacity of cement that is entering through the sea to the Cement Carrying Unit in Gudang Arang Benteng Kota Ambon reaching 600,000 tons per year or about 50,000 tons per month or an average of 1.7 tons per day.

Based on a preliminary survey conducted by the author in August 2019 of 17 employees in the Cement Carrying Unit of PT. Semen Tonasa in the Charcoal Warehouse Area whose lung function is still normal according to the initial measurement of 9 people, 3 employees who work in the Loading, Security and Electricity Section experienced mild restriction or lung function tissue that suffered minor damage, 1 employee who worked in the section the operator has mild obstruction or lung function network that is blocked, 2 employees who work in the operator and mechanical parts are experiencing moderate obstruction or in other words the lung function network has experienced moderate blockage and 2 employees who work in the Car Operator and Weigh Operator section experiencing a combination or experiencing rectification and obstruction.

METHOD

This research is an observational study using a cross sectional approach, which is a study to study the dynamics of the correlation between risk factors and impacts, with observations or data collection at the same time (point time approach). In this cross sectional study the researcher wanted to find out the relationship between risk factors and effects or effects by taking a momentary measurement. Thus a cross sectional study is to assess risk factors in the event of an effect. Measurement of the independent variable and the dependent variable is done only once, namely at the same time (Ministry of Health Republic of Indonesia, 2018).

RESEARCH RESULT

The use of Personal Protective Equipment in the form of masks only, not given workpakes, glasses, gloves, boot shoes so that there are some complaints that are conveyed by employees to third parties as their work partners but starting from coming to work until the implementation of this research is not given, only provide a one-use mask, then employees are replaced with a mask from a t-shirt that is used to cover their head, nose and mouth, while the other Personal Protective Equipment is not at all.

Respondents who have smoking habit are 37 people (92.5%) while those who do not have smoking habit are 3 people (7.5%). Of the 37 respondents who had the habit of smoking cigarettes after carrying out packing tasks, transporting cement even when carrying trucks into the cement hauling room. Whereas 3 respondents ranging from registering as UPS employees until the time of this study did not have a smoking habit.



The results of inhalation of dust inspections were 20 employees (50%) above the threshold value, while 20 employees (50%) were below the threshold value of 3 mg / m³ using the Personal Dust Sampler installed on employees who were respondents during working hours

The results of the room dust inspection using the High Volume Sampler tool at 3 locations of the UPS location namely in production room 1 with the result exceeding the threshold value that is 7.58 mg / m³, in production room 2 (transporting or collecting cars) have also exceeded the threshold value namely 7.25 mg / m³, while for measurement point 3, namely in the parking lot (car park) is still below the recommended threshold value of 3.87 mg / m³. The recommended threshold value is 5 mg / m³ according to Permenaker Number 5 of 2018.

Based on the results of the examination of lung function using spirometry to 40 respondents, 17 respondents (42.5%) had normal lung function capacity, 13 respondents (32.5%) had impaired pulmonary function, namely mild restrictive, 8 respondents (20%) have impaired pulmonary function in the form of mild obstructive, whereas 2 respondents (5%) have impaired pulmonary function both mild restrictively and mildly obstructive or said to be combination.

Table 1 Characteristics of Respondents

No	Characteristics	Average $\pm$ SD	Min-Maks
1	Inhalation of dust	2,65 $\pm$ 1,33	0,28 – 5,18
2	Lung Physiotherapy Capacity	75 $\pm$ 18,418	25 - 90
3	Room dust	7,25 $\pm$ 0,799	3,87 – 7,58

The amount of dust exposure obtained illustrates the amount of dust exposure received by each employee on each workday. Measurement of dust content in this work area is done at 3 points, namely in Production 1, Production 2 (pickup cars) and Parking Yard (Car Parking), this can be seen in the following table:

Table 2 Distribution of Work Areas by Cement Dust Level at UPS PT. Semen Tonasa Gudang
Arang Ambon City 2020

No	Measurement Location	> NAB	< NAB
1	Production 1	7,58 mg/m ³	
2	Production 2 (Container Cars)	7,25 mg/m ³	
3	Parking Yard (Car Parking)		3,87 mg/m ³



The results of the measurement of cement dust levels above show that: 38 employees (95%) work in work areas that have a dust content > NAB, ie in Production 1 there are 19 people (47.5%) with cement dust levels of 7.58 mg / m³, Production area 2 there are 19 employees (47.5%) with cement dust content of 7.25 mg / m³, while in the parking lot there are 2 employees namely 2 security (5%) who work with dust content <NAV ie 3, 87 mg / m³. Based on the measurement results, it is known that in the work area of production 1, and production 2 has a dust content of cement > NAV and has the potential to cause lung function disorders resulting in bronchitis.

Respirable dust or inhaled dust levels are the amount of dust that enters through inhalation into the pulmonary cavity of PT. Semen Tonasa Ambon City. Measurement of respirable dust levels using the Personal Dust Sampler tool for each respondent during work can be seen in table 3 below:

Table 3 Distribution of inhaled cement dust content at UPS PT. Semen Tonasa Gudang Arang Ambon City 2020

No	Inhalation of dust	Number of Respondents	%
1	< NAB	19	47,5
2	> NAB	21	52,5
	Total	40	100

Based on the measurement of respirable dust levels, it is known that the number of employees working in areas with high dust threshold values and this has the potential to cause pulmonary dysfunction resulting in bronchitis.

The pulmonary physiology function is categorized as disturbed if the FEV₁ / FVC capacity value <75%. The measurement results of 40 respondents obtained the following results:

Table 4 Distribution Distribution of Lung Capacity Test for Employees of UPS PT. Semen Tonasa Gudang Arang Ambon City 2020

No	Work area	Lung physiology function			Combination (restrictive and obstructive)	Total
		Normal	Disturbance Restrictive	Disturbance Obstructive		



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		n	%	n	%	n	%	n	%	n	%
1	Production 1	9	47,4	7	36,8	3	15,8	-	-	19	100
2	Production 2 (Container Cars)	7	36,8	5	26,3	5	26,3	2	10,6	19	100
3	Parking Yard	1	50	1	50	-	-	-	-	2	100
	Total	17	42,5	13	32,5	8	20	2	5	40	100

Based on the results of pulmonary physiology capacity measurements, it was obtained respondents data that lung function was still normal for 17 people. Based on the distribution of pulmonary physiology capacity measurements, it is known that respondents who experienced Restrictive Disorders in the function of lung function in the work area of Production 1 7 people (36.8%), Obstructive disorders in the function of the lung function in the work area of production 1 3 people (15.8%). Restrictive Disturbances in the production work area of 2.5 people (26.3%), obstructive 5 people (26.3%), while those experiencing combined disorders (Mild Restrictive and Mild Obstructive) 2 people (10.6%). In the parking lot, 1 person (50%) has a mild restrictive disturbance.

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DISCUSSION

The negative impact of cement industry activities in the form of air pollution by dust. Dust produced by the Cement Carrying Unit activity consists of cement dust produced during packing and transporting, dust generated during packing and even transportation of cement from the Cement Carrying Unit from silos to trucks and even to distributors is a pollutant in the air. directly affect the environment and humans.

The results showed that the average age of employees was 36.1 years with the youngest age of 20 years and the oldest 53 years. The average employee body weight is 61.5 kg with the lowest size of 47.0 kg and the highest is 83.0 kg, for the average height of employees of 162 cm with the lowest height of 145 cm and the highest 173 cm, the average service period of employees average of 5 years with the lowest service period of 1.0 years and 9.0 years, while for the length of work of employees according to working hours at PT. Semen Tonasa is an average of 8.4 hours with 8.0 hours lowest and 10 hours highest.

Several studies support the results of this study which also found the same thing: workers with pulmonary disorders were found most in the productive age group (15-44 years), one of



which was the study of Adha et al (2012) which stated that there was a relationship between age and incidence impaired pulmonary function in cement transport workers in Malundung Port, Tarakan City.

The results of the study by conducting X-ray examinations of 40 respondents found that 30 respondents were normal, 10 respondents had bronchitis. In addition, from the examination of pulmonary physiology capacity, there were 17 respondents with normal lung function, 13 respondents had pulmonary physiological disorders in the form of restrictive disorders, 8 respondents experienced obstructive disorders and 2 respondents experienced restrictive and obstructive disorders or a combination.

Based on the results of research conducted on 20 respondents who work as employees at UPS PT. Semen Tonasa Gudang Arang with exposure to inhaled dust with dust size $> 3 \text{ mg} / \text{m}^3$, 7 respondents (35.0%) had bronchitis, 13 people (65.0%) did not experience bronchitis. Whereas 20 employees who work in the same area by measuring dust levels with dust size $\leq 3 \text{ mg} / \text{m}^3$ are 3 people (15%) who experience bronchitis, and 17 people (85%) do not experience bronchitis.

This research is supported by a theory which states that the higher the dust level, the more likely it is to be affected by respiratory disorders and vice versa. In this study dust levels are above the NAV, the effect on the occurrence of impaired lung function can be directly seen in relation to the work area (Mukono, 2005). Dust entering the airways causes non-specific defense mechanism reactions such as coughing, sneezing, mucociliary transport disorders and phagocytis by macrophages. Smooth muscle around the airway can be aroused, causing constriction. This situation usually occurs when the dust level exceeds the threshold value. If there is more mucus or the mechanism of release is imperfect airway obstruction occurs so that airway resistance increases.

According to WHO (1985) and Crugr, et al (1985) Non-fibrogenic dusts that are dust that does not cause lung tissue reaction, for example are iron dust, lime and lead. This dust was once thought not to damage the lungs called inert dust, but it was known later that it was not really inert dust. In large doses, all dust is stimulating and can cause reactions even if mild. This reaction is in the form of excessive mucus production, if this continues it can occur mucous gland hyperplation. Lung tissue can also change with the formation of reticulin connective tissue. This lung disease is called non-collagen pneumonia.

CONCLUSION

The average age of UPS employees PT. Semen Tonasa Gudang Arang Ambon City Tahn 2020 is 36.1 years with the youngest age is 20 years and the oldest age is 53 years, Minimum respondent's service period is 1 year and maximum is 9 years, with a minimum length of work



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