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Coal Dust and Acute Respiratory Infections in South Kalimantan PT 'X' Coal Mining Workers

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Abstract

Occupational illness is a disease caused by a person's work or work environment. This disease is caused by the actions of someone who is unsafe (unsafe act) and unsafe condition (unsafe condition) in carrying out his work activities. The unsafe act is an act of someone who deviates from the rules of security standards that have been set in doing work. While unsafe conditions are conditions that can endanger workers. Acute respiratory infection is an acute inflammation of the upper and lower respiratory tract caused by infection with microorganisms, bacteria, viruses, and rickets, without or accompanied by pulmonary parenchyma. Factors that affect a person affected by ARI are environmental factors, individual characteristics, and worker behavior. Environmental factors include air pollution (air pollution due to industrial output and smoke from burning fuel). Dust particles that can cause acute respiratory problems from industrial products that pollute the air such as coal dust, cement, cotton, asbestos, chemicals, toxic gases, dust in rice mills (organic dust).

Keywords*: dust, ARI, work-related diseases*

Introduction

Occupational Diseases are diseases caused by work and the work environment. PAK risk factors include Physical, chemical, biological or psychosocial groups in the workplace. These factors in the work environment are the main causes and determine the occurrence of occupational diseases. Other factors such as individual vulnerability also play a role in disease progression among exposed workers[1].

Disease suffered by employees in relation to work both risk factors because of the conditions of the workplace, work equipment, materials used, production processes, work methods, company waste, and production results[2].

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The risk factors that can cause PAK are as follows[3]:

1. Physical group

a. Noise can cause interference with hearing through Non-induced hearing loss

b. Radiation (radioactive rays) can cause blood and skin abnormalities

c. High air temperatures can result in heat strokes, heat cramps, or hyperpyrexia. While low temperatures can result in frostbite, trench foot or hypothermia.

d. High air pressure can cause caisson disease

e. Lighting that is not enough can cause eye fatigue. High lighting can lead to accidents

2. Chemical groups

a. Dust can result in pneumoconiosis

b. Steam can cause metal fume fever, dermatitis and poisoning

c. gas can lead to CO and H2S poisoning

d. Solutions can cause dermatitis

e. Insecticides can cause poisoning

3. Group injection

a. Anthrax

b. Brucella

c. HIV / AIDS

4. Mental group

It can be caused by bad working relationships or monotonous work conditions that cause boredom.

The international body of the International Labor Organization (ILO) suggests 34% of the causes of deaths caused by occupation are cancer, 25% are accidents, 21% are respiratory diseases, 15% are cardiovascular diseases, and 5% are caused by other factors. Acute respiratory infection (ARI) is a major health problem as evidenced by the prevalence of ARI in Indonesia as much as 25.5% (range: 17.5% -41.4%) with 16 provinces including prevalence above the rate national and pneumonia as much as 2.1% (range: 0.8% - 5.6%)[4].

ARI is the main cause of infectious morbidity and mortality in the world. Nearly four million people die from ARI every year, 98% of which are caused by lower respiratory tract infections. Very high mortality rates in infants, children and the elderly, especially in countries with low and middle income per capita[5].

Acute respiratory infection (ARI) is an acute inflammation of the upper and lower respiratory tract caused by infection with microorganisms or bacteria, viruses, and rickets, without or accompanied by inflammation of the lung parenchyma.3 The factors that influence a person's risk of developing ARI are factors environment, individual characteristics, and worker behavior. Environmental factors include air pollution (cigarette smoke, air pollution due to industrial results and smoke from burning fuel for cooking with high concentrations). Individual factors such as age, sex, and education level can also influence the risk of susceptibility to ARI. Worker behavior includes smoking and the use of masks[6].

Indonesia is one of the countries that are rich in minerals, including gold, silver, copper, coal, oil, and gas. The coal mining industry can increase the country's foreign exchange but massive exploitation and use of natural resources by ignoring the environment results in short-term and long-term health impacts. The issue of energy sources is also becoming the government's main focus in relation to rising oil prices. Indonesia's coal reserves are larger than oil and natural gas reserves so the government began to see coal as an alternative energy source[7].

Coal dust is a complex mixture of various minerals, trace metals and organic materials with different degrees of coal particulates. Research by Nullolli et al. Revealed an increase in the number of people with asthma in children who live near or far from open coal mining locations. This indicates that the disease due to coal dust is related to the nature of dust that is easily carried away by the wind. Air pollution due to processing or the results of the coal mining industry will have a negative impact on the lungs of workers and communities around the mining area. Respiratory diseases that generally arise due to exposure to coal dust particles namely decreased air quality to a level that endangers the health and ultimately leads to an increase in respiratory disease disorders such as ARI[7].

Hasnur Group's coal mining business is currently handled by two subsidiaries, namely PT Energi Batubara Lestari which has reserves of 80 million Metric Ton, and PT Bhumi Rantau Energi has reserves of 200 million Metric Ton, located in Rantau, Tapin Regency, South Kalimantan. In addition, there are several coal projects currently under exploration (IUP Exploration). Hasnur also has special coal terminals located on the Putting River and Sungai Salai, South Kalimantan and a special port in Pendang, Central Kalimantan[8].

Material and Method

This study uses the Analytical Survey method with the Case Control approach which is an observational study that assesses the relationship of exposure to dust levels with people exposed to dust and those not exposed to dust, then compares the frequency of exposure to both groups.

This research was conducted in boiler units (cases) and filling units (control) in June 2017. The samples used were 40 people, namely 20 people from the boiler unit (control) and 20 people from the filling unit using a total sampling technique.

Data analysis used in univariate and bivariate analysis. Univariate analysis using frequency distribution and bivariate analysis using the Chi-Square test with a significance level of 0.05. If the value of $p \leq 0.05$ then Ho is accepted and if the value of $p > 0.05$ then Ho is rejected.

Findings

The measurement results of coal dust levels in the boiler unit are 2.2 mg / m3 and the unit filling is 0.9 mg / m3, so the results of these measurements on the boiler unit the dust content still exceeds the NAB and in the filling unit the dust is below the NAB, based on NIOSH (2011), that the NAB standard for coal dust in the permitted work environment is 2 mg / m3.

Based on the filling in questionnaires conducted on the boiler unit workforce, the results of 20 respondents who experienced ARI were 13 people (65%) and those who did not experience ARI as many as 7 people (35%) and in the unit filling workforce obtained results from 20 respondents who experiencing ISPA as many as 5 people (25%) and those who did not experience IspA as many as 15 people (75%).

From the results of measuring the levels of coal dust in the workplace environment and distributing questionnaires regarding ISPA on the workforce of PT. 'X' boiler units and filling units in South Kalimantan. Then performed a statistical test with the Chi-Square test using the SPSS version 21 computer program. For windows, the results were obtained regarding the levels of coal dust against ISPA in the workforce in the boiler unit of PT. 'X South Kalimantan, with a value of 0.011 so the value is $p < 0.05$, which means that the result is significant. Thus it can be stated that there is an effect of the level of coal dust on ARI on workers in the boiler unit of PT. 'X' South Kalimantan.

Conclusion

Occupational illness is a disease caused by a person's work. The cause of this disease can be caused by unsafe acts and unsafe conditions. The unsafe act is an act of someone who deviates from the rules that have been set and can cause harm to themselves and others, one of which is ISPA[9].

Risk factors for ARI are due to pollution, poor environmental conditions, for example, air pollutants, family member density, humidity, cleanliness, season and temperature. Some other factors are age, gender, smoking behavior, working period, length of exposure and use of masks that function as protective devices from dust[10].

Dust exposure can cause acute respiratory problems, one of which is an industrial product that can pollute the air such as coal dust, cement, cotton, asbestos, chemicals, toxic gases, dust in rice mills (organic dust) and others. Various factors influence the emergence of diseases or disorders of the airways due to dust[11].

There is a relationship of dust to the incidence of acute respiratory infections in coal mining workers.

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Ethical Clearance: This research was approved by the Institutional Ethics Board of Airlangga Surabaya University. All subjects received complete information about the procedure and purpose of this study, each subject before the study signed an informed consent form.

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