Nutritional Status, Dust Exposure and Risk Factors for Acute Respiratory Infections for Workers in Industrial Estates

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Abstract

Acute Respiratory Infections (ARI) are a health problem that has not been handled properly in Indonesia, every year the incidence of acute respiratory infections is still high, which can be fatal, namely death. Several factors cause acute respiratory infections such as nutritional status, dust exposure, length of exposure to dust, and years of service for workers in industries who have a high risk of acute respiratory tract infection problems. This study aims to determine the risk factors for acute respiratory infections in the industry. This study uses a cross-sectional approach with a sample of 89 respondents, where the results will be analyzed using the chi-square test. The result of this study is that there is a relationship between nutritional status, dusty workspace, length of exposure to dust, and length of work with the incidence of acute respiratory infections in industrial workers. Based on the results of this study, it is hoped that workers and the industry will pay attention to the use of PPE to minimize dust exposure to workers in the industry.

Keywords: *nutritional status, dust, acute respiratory infections*

Introduction

Industry in Indonesia is currently experiencing very rapid development, where industrial growth in Indonesia is currently experiencing an increase of 7% from the previous year. The industry is one that has become a mainstay and has received special attention from the Indonesian government. Along with the development of the industry not only has a positive impact but often has a negative impact caused by negligence from both managers and workers. Work accidents and occupational diseases are problems that have not been handled properly until now[1,2].

Every workplace always contains various potential hazards that can affect the health of workers or cause occupational diseases. One of the potential hazards in the workplace that can cause health problems is the potential for chemical hazards, especially those used in the production process[3]. These potential hazards can enter or affect the body of the workforce through inhalation (through breathing), ingestion (through the mouth to the digestive tract, and skin contact (through the skin). The effect of potential chemical hazards on the workforce depends on the type of chemical or contaminant. , the form of potential hazards (dust, gas, vapor, and smoke), toxicity, and entry into the body[4].

Dust produced from industrial processes is a particle that is easily inhaled by workers so that it can irritate the respiratory tract. The textile-producing industry is one of the industries that produce exposure to dust particles from the production process, this is one of the triggers for the occurrence of acute respiratory infections (ARI). The incidence of ISPA in Indonesia is one of the diseases that many people experience which can cause death[4,5].

ARI in developing countries like Indonesia is still classified as a major health problem, this can be seen from its fairly high spread and prevalence[6]. A person

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who lives in a rural area is attacked by ARI in one year on average three times and for urban areas, it can be up to six times. For people who work with exposure to dust particles have a much greater risk of getting an ARI[7,8].

ARI in industrial areas occurs due to several factors, one of which is the extrinsic factor. The first is the state of the material being inhaled (gas, dust, vapor). Dust that enters through inhalation can cause extensive fibrosis in the lungs and is antigenic. Other extrinsic factors are smoking behavior, length of exposure, behavior in using personal protective equipment (PPE), especially those that protect the respiratory system and exercise[9]. Intrinsic factors from within humans, especially those related to the lung defense system, both anatomically and physiologically, history of illness, gender, body mass index[10,11].

Material and Method

This study uses a cross-sectional study. The population in this study were 89 workers who were taken by random sampling, using data analysis, namely chi-square. This research was conducted in an industry in Indonesia, West Java Province. The variables studied were nutritional status, workspace, dust exposure, and years of service to the incidence of ARI among workers in the industry.

Findings

Table 1. Analysis of Risk Factors for ARI

	Bivariate				
	Not ARI	**ARI**	**Total**	**P-Value**	**OR**
Normal Nutritional Status	19 (61,3%)	12 (38,7%)	31 (100%)	0,001	0,895 (0,367 – 2,183)
Abnormal Nutritional Status	34 (58,6%)	24 (41,4%)	58 (100%)		
Dusty Workspace	28 (50,9%)	27 (49,1%)	55 (100%)	0,000	0,782 (0,378 – 1,850)
Dustless Workplace	25 (73,5%)	19 (38%)	54 (100%)		
Duration of Dust Exposure < 8 jam/ hari	22 (56,4%)	17 (43,6%)	39 (100%)	0,000	0,793 (0,388 – 1,860)
Duration of Dust Exposure ≥ 8 jam/ hari	31 (62%)	19 (38%)	50 (100%)		
Years of service < 5 tahun	11 (64,7%)	6 (35,3%)	17 (100%)	0,043	1,310 (0,436 – 3,932)
Years of service ≥ 5 tahun	42 (58,3%)	30 (41,7%)	72 (100%)		

Discussion

Nutritional Status

The results of the study found 12 workers with normal nutritional status (38.7%) suffered from ARI, while 24 (41.4%) workers with abnormal nutritional status suffered from ARI. The analysis showed that the p-value was 0.001 < α 0.05, which means there was a relationship between nutritional status and the incidence of ARI.

If a person lacks food intake, it will cause the immune system to become weak, making it easier for that person to get infectious diseases. In the case of malnutrition, individuals will be more susceptible to infection due to decreased immunity to invading pathogens[12].

Dusty Workspace

The results of the study found that 19 (38%) of workers with dust-free workspaces suffered from ARI, while 27 (49.1%) of workers with dusty workspaces suffered from ARI. The results of the analysis show that the p-value is 0,000 < α 0.05, which means that there is a relationship between dusty workspace and the incidence of ARI.

Dust is a material that is often referred to as particles floating in the air with a size of 1 micron to 500 microns. In the case of air pollution both inside and outside the building, dust is often used as an indicator of pollution. Used to show the level of danger both to the environment and to occupational health and safety[13–15].

Exposure to dust can cause acute respiratory problems, one of which is industrial products that can pollute the air such as coal dust, cement, cotton, asbestos, chemical substances, toxic gases, dust in rice mills (organic dust) and others. Various factors influence the emergence of disease or airway disorders due to dust[16,17].

Duration of Dust Exposure

The results of the study found that 17 workers exposed to dust <8 hours/day (43.6%) suffered from ARI, while 19 workers who were exposed to dust ≥ 8 hours/day had ARI (38%). The results of the analysis show that the p-value is 0.000 < α 0.05, which means that there is a relationship between dust exposure and the incidence of ARI.

The longer a person works, the higher the risk level for pulmonary function disorders. Besides, the length of service determines the length of time a person is exposed to the risk factors of exposure to dust, so the greater the length of time a person is exposed, the greater the risk of developing lung disease[13,18,19].

The threshold value (TLV) for dust content is the standard of work environment factors that are recommended in the workplace so that workers can still receive them without causing illness or health problems, in daily work for a time not exceeding 8 hours a day or 40 hours a week (Permenakertrans RI No.13 of 2011). For dust particles, it has been stipulated in the Minister of Manpower and Transmigration Regulation No. PER 13/MEN/X/2011 concerning the threshold value for physical and chemical factors in the air of the working environment is that TLV dust levels should not exceed 3.0 mg/m^3. The threshold value for dust that only interferes with work enjoyment is 10mg/m^3. TLV of dust concentration in ambient air in Indonesia is also regulated in the Decree of the Minister of Health of the Republic of Indonesia Number 1405/MENKES/SK/XI/2002 concerning health requirements for office and industrial work environments, amounting to 10mg/m^3 for an average measurement time of 8 hours[2,4,8].

Years of Service

The results of the study found that 6 (35.3%) of workers with a working period of <5 years suffered from ARI, while workers who had a work period of ≥ 5 years suffered from ARI as much as 30 (41.7%). The results of the analysis show that the p-value is 0.043 <α 0.05, which means that there is a relationship between years of service and the incidence of ARI.

The effect of dust on the respiratory tract has shown that dust levels are associated with the incidence of respiratory symptoms, especially coughs. In the respiratory tract, the dust that settles to accumulate mucosal edema on the walls of the respiratory tract, causing respiratory constriction[20,21].

The effect of industrial dust levels on the work environment must be watched out for because the dust in the environment is in the air and is always

inhaled by workers every day[9]. If workers who work in an environment with high dust concentrations for a long time will have the risk of developing respiratory problems, especially with workers who have worked for more than 5 years in a work environment with high concentrated respiratory dust[22] The length of exposure in a day is one of the risk factors in the occurrence of pulmonary function disorders in workers. That the longer the working period of a person, the higher the risk level in the occurrence of pulmonary function disorders[1,21,23].

Conclusion

The results showed that nutritional status, dusty workspace, years of work, duration of dust exposure were related to the incidence of ARI among industrial workers.

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All subjects were fully informed about the procedures and objectives of this study each subject before the study signed an informed consent form.

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