Correlation Between Physical Working Environment Factors and Acute Respiratory Infections (ARI) in Furniture Manufacturing Company Workers of Pt. Niaga Merapi Yogyakarta[1]

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ABSTRACT

Background: Infectious diseases incident which is still high in percentage recently is Acute Respiratory Infections (ARI). Dissemination of the disease is extensive, and its complication is dangerous, which leads to mortality. The environment has a significant influence on health. Furniture manufacturing is a prone location that becomes the agent of virus or bacteria causing Acute Respiratory Infections (ARI). Interview with 10 Furniture manufacturing company workers of PT Niaga Merapi Yogyakarta reveals that 30% of them have experienced signs and symptoms of Acute Respiratory Infections (ARI).

Objective: The study was to investigate the correlation between physical working environment factors and Acute Respiratory Infections (ARI) in furniture manufacturing company workers of PT. Niaga Merapi Yogyakarta.

Research Method: The study employed descriptive correlation with a cross-sectional approach. The samples were taken using non-probability sampling with accidental sampling type resulting in 80 workes as the samples. The data were analyzed using the Chi-Square test.

Result: Based on test analysis using Chi-square, the p-value was 0.000 (<0,05), and the correlation value was 0.424. Most of the furniture workers, namely 44 people (55.0%), were included in the category of Acute Respiratory Infections (ARI), and 45 people (56.3%) worked in the unstandardized working environment.

Conclusion: There was a correlation between physical working environment factors and Acute Respiratory Infections (ARI) in furniture manufacturing company workers of PT. Niaga Merapi Yogyakarta.

Suggestion: It is suggested that the owner of PT. Niaga Merapi Yogyakarta furniture manufacturing company measures the temperature, humidity, and light management regularly to guarantee a stabilized physical working environment condition.

Keywords: Acute Respiratory Infections (ARI), Physical working environment

INTRODUCTION

Acute Respiratory Infection (ARI) is an acute infectious disease that attacks one or more parts of the respiratory tract starting from the nose to the lung's bag (alveoli), including the sinuses/cavities around the nose (sinus in the nasal), middle ear cavity and pleura. ARI is caused by several groups of bacteria, viruses, and rickettsia, which can be more than 300 kinds. The virus causes an upper respiratory infection of 90-95%.

In developing countries, lower respiratory tract infections, especially pneumonia, are caused by bacteria from the genus streptococci, Haemophilus, pneumococci, bordetella, and corynebacterium; currently, in the developed countries, ARI is caused by a virus, adenovirus, coronavirus, picornavirus, and herpesvirus [1]. ARI is a severe health problem both in Indonesia and in the World. In 2008, UNICEF and WHO reported that ARI was the most significant cause of death in humans than the total deaths from AIDS, malaria, and measles.

Deaths from 99.9%ARI, especially pneumonia, occur in developing countries such as Sub-Saharan Africa and Asia, especially in Southeast Asia and South Asia. Sub Saharan recorded 1,022,000 cases per year while South Asia reached 702,000 points per year [2]. The Indonesian government has made efforts to reduce ARI incidence at the district or city level, namely a program called P2 ARI (Control of ARI) [3].

P2 ARI guidance is addressed to all Primary Health Centers in each sub-district area. A disease can be caused by the interaction between the host, agent, and environmental components. Changes to one part can result in disruption of balance which leads to disease. Risk factors for ARI can be influenced by host factors (age, immunity, education, knowledge, etc.), agent factors (number of microorganisms that cause or concentration of pollutants in the environment), and environmental factors (e.g., physical work environment or physical environment) [4].

Industrial development with various types certainly has a positive and negative impact, the positive effects of industrial development in the form of labor absorption and improving the economy in both industrial and national areas. The adverse effects that may result from industrial activities in the form of waste problems (solid and liquid) and environmental pollution (water, air, and soil) will affect workers and communities around the industry. The work environment, especially the physical environment, can be a risk factor for workers' health status [5].

The results of preliminary research conducted by the researcher in the work environment at PT. Niaga Merapi showed that the atmosphere was immaculate. Lighting in each workspace was bright; the type of roof used was the type of asbestos in which the roof with asbestos material could not absorb heat so that the temperature produced in the room was hot, especially during the day. Ventilation in the room was not adequate because the hole's size was too small and only in some parts. The floor also used the cement floor type; this type of bed was hard and moist, so it was less comfortable when used. The researcher also conducted interviews with ten furniture workers. The

interviews showed that among ten workers obtained 30% of data claiming to have had a fever for more than seven days with cough with phlegm and shortness of breath which was suspected to be signs and symptoms of ARI.

The study aimed to determine the relationship between physical work environment factors and the incidence of Acute Respiratory Infection (ARI) in workers in the furniture industry of PT. Niaga Merapi Yogyakarta.

RESEARCH METHODS

This study used a non-experimental research method with a descriptive correlation study design. A research method was directed to explain the relationship between two variables, namely independent variables with dependent variables. The cross-sectional approach method was a study to analyze the dynamics of the correlation between risk factors and effects by approaching, observing, or collecting data at once [6].

The population respondents in this study were all workers working in the furniture industry of PT. Niaga Merapi Yogyakarta. They were 24 years to 50 years old as many as 100 people. Non-probability sampling technique with the type of accidental sampling was used in the study. The samples used 80 respondents. Data analysis used in this study Chi-Square with a significant level of 5%.

RESULTS

Data retrieval was carried out in February 2018 by using the questionnaire; then, the questionnaire was numbered to facilitate data processing. This research was conducted in the furniture industry of PT. Niaga Merapi Yogyakarta. Respondents in this study were furniture workers aged 24-50 years, totaling 80 people, and the characteristics of respondents were seen from the respondent's age, gender, length of work, and respondents' smoking behavior. The results of univariate analysis of the features of respondents could are described in the table below:

Table 1. Frequency Distribution of Respondent's Characteristics based on Age, Sex, Work Duration, and Smoking Behavior in PT. Niaga Merapi Yogyakarta

Respondent's Characteristics	Frequency	Percentage (%)
Age		
24-29 years old	11	13.8
30-39 years old	41	51.3
40-50 years old	28	35.0
Total	80	100
Sex		
Male	62	77.5
Female	18	22.5
Total	80	100
Work duration		
5-9 year	29	36.3
10-15 year	51	63.8
Total	80	100
Smoking Behavior		
Smoking	30	37.5
Not smoking	50	62.5
Total	80	100

Table 1 showed that most respondents in this study were in the age of 30-39 years, as many as 41 people (51.3%), while the gender characteristics were mostly male

as many as 62 people (77.5%). Based on the features of the duration of the work of the respondents, most of the respondents had worked for 10-15 years as many as 51 people (63.8%), and based on the characteristics of the smoking behavior in this study; there were 50 non-smokers (62.5%). The results of data analysis using the Chi-Square test could be seen in the table below:

Table 2 Relationship between Physical Work Environment Factors and Occurrence of Acute Respiratory Tract In Workers in Furniture Industry PT. Niaga Merapi Yogyakarta

Variables	Correlation	Significance	Results
Physical Work Environment Factors and Occurrence of Acute Respiratory Tract	0.424	0.000	Significant

Based on Table 2, it could be seen that the results of the analysis with Chi-Square test obtained a 0.424 correlation coefficient with a Significance of 0.000 because the value of p was<0.05, this meant that Ho was rejected and Ha was accepted, meaning that there was a relationship between physical work environment factors and events ARI for workers in the furniture industry of PT. Niaga Merapi Yogyakarta was in the medium category (0,400-0,599).

DISCUSSION

1. **Physical Work Environment:** The results of the measurement of the physical work environment in the furniture industry of PT. Niaga Merapi Yogyakarta showed that 45 (56.3%) respondents were in a physical work environment that did not meet the requirements. While 35 (43.8%) respondents worked in an environment still within the limits of fulfilling the requirements. This showed that many furniture industry workers at PT. Niaga Merapi worked in a work environment that did not meet the criteria. This was in line with Indah Pratiwi's research in 2013 about the work environment and health problems of workers in the furniture industry; the results of processing data obtained stated that almost 52.35% of workers in the furniture industry workers worked in environments that did not meet the requirements because they had above-normal temperatures due to the absence of a ventilation system.

The physical work environment is all the conditions around the workplace that will affect workers both directly and indirectly [7]. Factors affecting the physical work environment are the temperature at work, humidity in the workplace, lighting in the workplace, and air circulation in the workplace [8].

High temperatures will cause pollutants in the air to form dry and light particles to last longer in the air, especially in the dry season. Temperature changes can allow pathogenic microorganisms (bacteria and viruses) to grow wider, leading to disease threats in the respiratory tract [9]. The conditions for the industrial environment's air temperature that meet the requirements are 18°C-30 °C [10].

High humidity is a useful tool for the growth of microorganisms because viability is longer [11]. Microorganism in the air is an essential element of pollution

because it can cause disease symptoms, such as the respiratory tract, eye irritation, skin, and others [12].

Industrial air humidity that meets the requirements is 65% -95% [13]. Good lighting is natural lighting or comes from direct sunlight; in addition to saving lighting energy with direct sunlight can kill pathogenic germs with the ultraviolet light they contain [14].

The industrial environmental lighting requirements that meet the requirements are ≥ 1500 Lux [13]. A healthy work environment is a work environment that meets the needs of each component.

2. **Acute Respiratory Infection (ARI):** ARI incidences found in this study were high; respondents who experienced ARI were 44 (55.0%) furniture workers, and those who did not share ARI were 36 (45.0%). ARI is an inflammatory process caused by viruses, bacteria, and rickets.

ARI can attack infants, adults, and the elderly. ARI can show several symptoms such as cough, runny nose, shortness of breath, and fever. Determination of the incidence of ARI is determined by the presence of two or more of these symptoms [15]. Many signs of ARI that are not appropriately observed may cause many cases of ARI that cause complications. Hence, access to health services on time will reduce the risk of severity and even death [16].

The results of this study were in line with the results of research conducted by Handayuni. The survey results of the univariate analysis showed ARI frequency distribution 66.0% of respondents suffered ARI disorders, high dust levels 74, 5%, and the use of personal protective equipment is 36.2%. In contrast, in bivariate analysis, there is a significant relationship between the level of dust (p-value = 0,000), personal protective equipment (p-value = 0,003) and ARI in furniture workers. Dust levels, years of service, and use of personal protective equipment show a significant association with ARI disorders. The furniture is recommended to provide personal protective equipment, especially masks, and the regular monitoring and inspection of furniture workers by the Health Office [17]. Furniture workers are one of the populations at high risk for ARI; this is caused by exposure to wood dust in the workplace and caused by a bad work environment that will affect the spread of viruses and bacterial infections [18].

3. Relationship between Physical Work Environment Factors and Acute Respiratory Tract Occurrence In Furniture Workers: Based on the results of this study, it was found that 34 workers experienced the incidence of ARI, and they worked in a bad work environment as many as 34 (42.5%) workers. Meanwhile, workers who did not experience ARI and worked in a bad work environment as many as 11 (13.8%) workers. The atmosphere is very influential on health.

Healthy environmental conditions make people live healthy, otherwise poor ecological conditions or environments that do not meet the requirements make the community vulnerable to various kinds of diseases, both infectious diseases and non-infectious diseases [19]; for example, is ARI. The analysis results with the Chi-Square test obtained a correlation value of 0.424 and a significant value of 0.000 which was smaller than 0.05 (sig <0.05). It meant that the result was significant, which meant that it had a meaningful and moderate relationship between the

physical work environment and ARI incidence in workers in the furniture industry PT. Niaga Merapi Yogyakarta.

There was a significant relationship between physical work environment factors and the incidence of ARI in workers; of course, it was seen in each component of the physical work environment factors. Based on this study, the results of room temperature in some points more than 30°C is 31.2°C indicated that it did not meet the requirements. Room temperature that exceeds normal limits and unclean air conditions, and changing weather triggers ARI triggers [3]. However, the humidity and room lighting still met normal limits.

The results of this study were in line with the results of previous research conducted by Fuqaha. The bivariate analysis using Rank Spearman (α = 0.05) showed the correspondent variables were the levels of fine dust (ρ Value 0.007), age (ρ Value 0.036), nutritional status (ρ Value 0.005), tenure (ρ Value 0.029). Meanwhile, there is no correlation were the history of respiratory illness (ρ Value 0.204) and exercise habits (ρ Value 0.410) [20].

CONCLUSION

There was a relationship between physical work environment factors and the incidence of Acute Respiratory Infection (ARI) in furniture workers at PT. Niaga Merapi Yogyakarta (r = 0.424, p <0.05).

It is expected that the research results can develop the knowledge of diseases, especially in the scope of community nursing—furniture industries, especially PT. Niaga Merapi or the management of the company, are expected to apply good housekeeping and maintenance, namely the maintenance and cleanliness of the room and work equipment, in addition to being able to add adequate ventilation to ensure the temperature, average humidity, fresh air circulation in the workspace, and maximizing the entry of sunlight to the room. It is also suggested that related health service institutions around the industrial area can periodically monitor the health status of formal industrial workers and monitor and evaluate the quality of the industrial work environment. For respondents or furniture workers, they are expected to comply with personal protective equipment, namely the use of PPE such as a mask to protect themselves from health hazards besides checking their health regularly and applying a healthy lifestyle. For other researchers, it is expected to develop this research by taking more samples with other factors that influence Acute Respiratory Infections (ARI).

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