The Relationship Between Age And Working Period With The Occurrence Of Respiratory Disorder Symptoms In Wood Saw Operators
In Bondowoso Regency 2023

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Abstract

The timber industry in Indonesia is undergoing a period of growth, which has a positive impact on society by creating employment opportunities. However, this practice also exerts a detrimental effect on the environment, leading to pollution that adversely impacts the health of workers, including respiratory disorders caused by sawdust. The etiology of respiratory disorders is multifactorial, with age and length of service being salient contributors. The objective of this study is to examine the correlation between age and the duration of employment, on the one hand, and the incidence of respiratory symptoms among wood sawing workers in Bondowoso Regency on the other. The population of this study comprised 84 workers who met the inclusion and exclusion criteria. The present study employed a quantitative research method, incorporating cross-sectional. The findings of the research employing bivariate analysis demonstrated that the age of wood saw workers exhibited a p-value of 0.007, which is less than 0.05. The results of experience yielded a p-value of 0.001, which is less than 0.05, thereby indicating a significant association with the occurrence of respiratory symptoms. The study's recommendations to mitigate the occurrence of respiratory symptoms include the utilization of PPE masks, the consumption of nutritionally balanced meals, and the observation of activity patterns through regular exercise.

Keywords: PPE, Wood Saw, Occurrence Of Respiratory

INTRODUCTION

The Indonesian timber industry is undergoing a period of growth, which has a positive impact on society by creating new employment opportunities and improving the standard of living for the Indonesian populace. However, it is imperative to acknowledge the adverse environmental consequences of this practice, as it has been observed to result in significant levels of pollution. This, in turn, poses a dual threat to both the natural world and the well-being of humanity (1). The wood sawing industry has the potential to cause air pollution in the form of flying wood dust. In the context of wood sawing, it has been estimated that 10–13% of the wood dust produced is released into the atmosphere (2).

The inhalation of wood dust from sawing has been demonstrated to have a detrimental effect on the respiratory

system of sawmill workers, potentially leading to the development of respiratory disorders (3). Respiratory disorders represent a category of occupational diseases arising from exposure to dust in the work environment (4). The initial symptoms of respiratory illness manifest as a result of workers inhaling airborne dust, which subsequently accumulates in the nose and throat, and, in some cases, infiltrates the lungs (5). The prevalence of respiratory disorders caused by sawdust is influenced by several factors, including the age of the worker and the duration of exposure (6). The accumulation of sawdust in the respiratory tract is a consequence of the duration of work, as evidenced by (7).

The duration of employment has been demonstrated to influence the body's exposure to dust, as prolonged exposure to wood dust has been shown to result in increased dust accumulation in the respiratory tract. Employees who have been in their positions for a minimum of five years have been found to be 5.44 times more likely to exhibit symptoms of chronic respiratory disorders in comparison to those who have been in their positions for less than five years (8). Work duration is one of the indicators employed to assess the length of time workers are exposed to dust particles. In the context of occupations characterized by high levels of dust exposure, with prolonged exposure to such environments, the risk of developing occupational lung diseases is significantly elevated. As indicated by (9), workers who have been employed in dusty environments for a period exceeding five years are more prone to exhibiting risk factors associated with obstructive lung diseases.

In addition to the duration of employment, the age of the worker has been identified as a contributing factor to the development of respiratory disorders. The term "age" is used to denote the process of aging or increasing age. As the population ages, the prevalence of respiratory disorders increases (10). A decline in lung function typically manifests during the third and fourth decades of life, affecting individuals between the ages of 30 and 40. As the age of the patient increases, the prevalence of concomitant disorders rises concomitantly, including respiratory symptoms (11). As workers age and are exposed to dust more frequently, this accelerates the decline in lung function, making them more susceptible to respiratory symptoms (12).

According to the International Labour Organization (ILO), of the total number of work-related fatalities, 21% were attributed to respiratory tract disorders (13). The results of observations conducted through initial interviews at a wood sawmill company in Bondowoso Regency, involving a total of 54 workers, revealed that 15 (27%) workers experienced respiratory symptoms such as coughing, chest pain, wheezing, flu, and shortness of breath.

The results of observations conducted by researchers have indicated a potential relationship between age and length of service, on the one hand, and the incidence of respiratory disorders among wood sawmill workers in the Bondowoso district, on the other. Consequently, there is a research interest in conducting further research related to this relationship.

RESEARCH METHOD

This study was conducted in two subdistricts in Bondowoso, namely Curahdami and Kademangan, from January to May 2023. These two subdistricts are the centers of the wood sawing industry in Bondowoso Regency.

The present study employed quantitative research methodologies, incorporating observational analysis through a cross-sectional approach. The population of this study comprised 84 wood saw workers. The present study employed a total sampling method, thereby encompassing the entire population of 84 wood saw workers.

The analysis employed in this study utilized univariate analysis, a method essential for deriving percentage results for each variable examined through frequency distribution. The utilization of bivariate analysis is instrumental in ascertaining the influence of the variables under study. The objective of bivariate analysis is to ascertain the existence of a relationship between the independent variables (i.e., age and length of service) and the dependent variable (respiratory disorder symptoms).

RESULTS AND DISCUSSION

The research results were obtained based on the administration of questionnaires to respondents. The characteristics of the respondents and the relationship between the independent variables and the dependent variables can be examined as follows:

Table 1. Distribution of Respondents Based on Gender, Age, Length of Service, and Symptoms of Respiratory Disorders.

Variable	Categories	Frequency	Percentage
Gender	Men	84	100
	Women	0	0,0
Age	17 - 25 year	3	3,6
	26 - 35 year	17	20,2
	36 - 45 year	33	39,3
	> 46 year	31	36,9
Employment Period	<6 Mounth	0	0,0
	6 Mounth - 1 Year	0	0,0
	1 - 2 Year	6	7,1
	2 - 3 Year	10	11,9
	3 - 4 Year	13	15,5
	> 5 Year	55	65,5
Symptoms of Respiratory Disorders	Lightweight	57	68
	Currently	22	26
	Weight	5	6

As indicated by the data presented in Table 1, it is evident that the total number of male wood saw operators is 84, constituting 100% of the operator population. Of the 84 respondents, 3 (3.6%) were aged 17–25 years, 17 (20.2%) were aged between 26 and 35 years, 33 (39.3%) were aged between 36 and 45 years, and 31 (36.9%) were aged over 46 years. The data set included 6 respondents who had been employed for 1–2 years, 10 respondents who had been employed for 2–3 years, 13 respondents who had been employed for approximately 3–4 years, and 55 respondents who had been employed for

more than 5 years. Among the cohort of wood sawing workers, 57 (68%) respondents exhibited mild respiratory symptoms, 22 (26%) respondents exhibited moderate respiratory symptoms, and 5 (6%) respondents exhibited severe respiratory symptoms.

Table 2. The distribution is contingent upon the relationship between age and the duration of service, with the manifestation of respiratory disorder symptoms.

Variable	Gejala Gangguan Pernafasan								P value
	Lightweight		Currently		Weight		Amount		
	n	%	n	%	n	%	n	%	
Usia									
26-35 tahun	6	35	10	59	1	6	17	100	
36-45 tahun	25	69	9	25	2	6	36	100	0,007
> 46 tahun	26	84	3	10	2	6	31	100	
Masa Kerja									
1 - 2 tahun	3	50	3	50	0	0	6	100	
2 - 3 tahun	4	40	6	60	0	0	10	100	0,001
3 - 4 tahun	7	47	8	53	0	0	15	100	
> 5 tahun	43	82	5	9	5	9	53	100	

As indicated by the findings presented in Table 2, an association was observed between age and the duration of service with regard to the prevalence of respiratory symptoms. Among workers aged 26 to 35 years, 6 respondents (35%) exhibited mild respiratory symptoms, 10 respondents (59%) demonstrated moderate symptoms, and 1 respondent (6%) displayed severe symptoms. Among the workers in the 36–45 age range, 25 (69%) respondents exhibited mild respiratory symptoms, 9 (25%) respondents exhibited moderate respiratory symptoms, and 2 (6%) respondents exhibited severe respiratory symptoms. Among workers aged over 46 years, 26 (84%) respondents exhibited mild respiratory symptoms, 3 (10%) exhibited moderate respiratory symptoms, and 2 (6%) exhibited severe respiratory symptoms.

The context of a study on occupational health, the analysis focused on the relationship between work tenure and the prevalence of respiratory symptoms among workers. The findings revealed that among employees with a work tenure of 1–2 years, 3 respondents (50%) exhibited mild respiratory symptoms, while 3 respondents (50%) displayed moderate respiratory symptoms. Among workers with a work tenure of 2–3 years, 4 (40%) respondents exhibited mild respiratory symptoms, and 6 (60%) respondents manifested moderate respiratory symptoms. Among workers with a work tenure of 3–4 years, 7 (47%) respondents exhibited mild respiratory symptoms, and 8 (53%) respondents manifested moderate respiratory symptoms. Among workers with a work tenure of over 5 years, 43 (82%) respondents exhibited mild respiratory symptoms, 5 (9%) respondents exhibited moderate respiratory symptoms, and 5 (9%) respondents exhibited severe respiratory symptoms.

As demonstrated in Table 2, the results of the chi-square test with a 95% confidence level ($\alpha = 0.05$) indicate a p-value of 0.007 for the age of wood saw operators. This p-value is less than 0.05, suggesting a significant relationship between the age of wood saw operators and the occurrence of respiratory

symptoms. The results of the Chi-square test analysis for work experience yielded a p-value of 0.001, which is less than 0.05, thereby indicating a significant association with the occurrence of respiratory symptoms.

The present study seeks to establish a correlation between age and the occurrence of respiratory disorders. Preliminary bivariate analysis (see Table 2) indicated a statistically significant relationship between age and the manifestation of respiratory symptoms. This conclusion was supported by the results of the Chi-square test, which yielded a p-value of 0.007, indicating that the result was less than 0.05. This finding aligns with the findings of the study by Medyati et al (2023) which demonstrated a significant association between worker age and the prevalence of respiratory symptoms among furniture industry employees in Abepura District, with a p-value of 0.029 < 0.05. Another study conducted by Nabuasa in 2020 (15) stated that age also has a relationship with lung function disorders among wood furniture workers in Oesapa Kelapa Lima Village, Kupang City District (p-value = 0.002).

As age increases, there is a concomitant likelihood of a decline in lung function. As workers age, a positive correlation is observed, indicating that workers become more vulnerable to the effects of exposure, particularly from dust exposure in the workplace. This exposure can lead to a decrease in organ function, reduced immune system strength, and a decrease in lung vital capacity (16). As demonstrated in the research by Talamoa & Nurfadillah, (2025), age is the primary factor influencing lung function impairment.

As indicated by tahun Anissah et al., (2025), workers over the age of 40 have a higher risk of experiencing respiratory symptoms in comparison to workers under the age of 40. Physiological evidence indicates that with advancing age, there is a decline in the natural functionality of all organs, including the lungs (18). In individuals over the age of 40, there is an automatic decrease in maximum respiratory muscle strength of 20%, which leads to an increased accumulation of dust in the lungs and other tissues throughout the body (19). Consequently, it is imperative for workers who are susceptible to adverse health outcomes due to their age to prioritize health and safety in the workplace. This entails the consistent utilization of personal protective equipment, such as masks, to mitigate the risk of exposure to pathogens or harmful substances (20).

Personal protective equipment (PPE) in the form of masks serves to protect the respiratory system by supplying clean, healthy air and filtering out small airborne particles such as dust (21). Furthermore, it is recommended that workers who are at risk of respiratory issues maintain a balanced diet and engage in regular physical activity tailored to their needs (16).

The relationship between length of service and the occurrence of respiratory disorders As indicated by the findings presented in Table 2, among the 84 respondents, five workers with a tenure of over five years exhibited severe respiratory symptoms. The results of the Chi-square analysis indicated a p-value of 0.001, suggesting a significant association between years of service and the occurrence of respiratory symptoms. This

study aligns with research conducted by Zia et al., (2022), which yielded a p-value of 0.003, indicating that <0.05. This result indicates a relationship between the duration of exposure to wood dust and respiratory complaints among woodworkers in Banda Aceh City. Furthermore, the study conducted by Medyati et al (2023) revealed that work duration emerged as the predominant factor influencing the prevalence of respiratory disorders, as evidenced by a p-value of 0.002.

Work tenure is defined as the duration an employee has been employed by a company, measured from the commencement of employment until the time of the study (23). The duration of an individual's employment is directly proportional to their exposure to the potential hazards associated with their work environment (Sukma Ika Noviarmi, 2023). It has been demonstrated that workers exposed to elevated levels of dust in the workplace over an extended period are susceptible to the development of pulmonary obstruction (25).

It has been demonstrated that workers who engage in work activities involving high levels of dust exposure over an extended period of time are more susceptible to developing respiratory diseases, including respiratory complaints such as shortness of breath, coughing, fatigue, and frequent phlegm production (26). The duration of employment has been identified as a risk factor for the development of restrictive or obstructive conditions among workers in dusty industries with over five years of exposure (27).

CONCLUSIONS

It has been demonstrated that workers who engage in work activities involving high levels of dust exposure over an extended period of time are more susceptible to developing respiratory diseases, including respiratory complaints such as shortness of breath, coughing, fatigue, and frequent phlegm production (Yudi Akbar et al., 2024). The duration of employment has been identified as a risk factor for the development of restrictive or obstructive conditions among workers in dusty industries with over five years of exposure.

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ACKNOWLEDGEMENT