



# The Correlation Between Compliance with the Use of PPE with the Incidence of Acute Respiratory Infections (ARI) at PT. Alba Unggul Metal

Nugraheni Puji Lestari, Moch. Yunus, Anita Sulistyorini<sup>(✉)</sup>, and Anindya Hapsari

Universitas Negeri Malang, Malang, Indonesia  
anita.sulistyorini.fik@um.ac.id

**Abstract.** The International Labor Organization (ILO) estimates that 2.78 million workers die each year. The causes of death of 2.4 million are caused by occupational diseases, one of which comes from the manufacturing industry, where air pollution is one of the impacts of work activities. Diseases from air pollution, namely respiratory disorders such as acute respiratory infections (ARI). The purpose of this study was to determine the relationship between compliance with the use of PPE with the incidence of ARI at PT. Alba Unggul Metal. This research method uses analytical observation with as many as 33 workers from the welding and painting departments as respondents. Analysis of the research data using the Spearman. The results of this study revealed that 57.6% of respondents were categorized as non-compliant with using PPE during work. Respondents of 69.7% were categorized as having experienced ARI. In addition, 51.5% of respondents do not comply with using PPE and have experienced ARI with the Spearman showing that the correlation coefficient is  $-0.501$  with a significant number of  $0.003$ . Based on this, it can be concluded that there is a relationship between compliance with the use of PPE with the incidence of ARI at PT. Alba Unggul Metal.

**Keywords:** Worker · Personal Protective Equipment · Acute Respiratory Infections

## 1 Introduction

Occupational disease (PAK) is a disease caused by work activities. The International Labor Organization (ILO) estimates that 2.78 million workers die each year. The cause of death of 2.4 million workers (86.3%) was caused by occupational diseases [1]. The existence of occupational diseases in Indonesia, one of which comes from the manufacturing industry, where the field of work that manages raw materials into a product that is ready for use. Based on the data and information center of the Indonesian Ministry of Health, the percentage of workers who have health complaints who work in the manufacturing industry is 24.84% [2]. Various kinds of processes in the management of materials in the manufacturing industry do not rule out the possibility of having a high

risk of PAK. One of the problems caused by industrial activities is air pollution. Diseases from air pollution, namely respiratory disorders, one of which is acute respiratory infection (ARI) [3]. Based on the latest Riskesdas report in 2018, there were 1,017,290 cases of ARI in Indonesia. In the province of Banten, it has a prevalence of 11.9% with a total of 48,621 cases. The labor category has a prevalence of 8.6% with a total of 75,590 cases. Therefore, special attention is needed regarding occupational diseases [4].

ARI disease in workers is caused by chemical factors in the form of dust from work activities carried out by workers, this is due to the lack of discipline of workers in wearing personal protective equipment (PPE), where the use of PPE is the final step of efforts to control accidents and occupational diseases [5]. However, this is often underestimated by workers because the use of PPE sometimes even interferes with the comfort of workers while working [6]. This behavior is caused by workers who still do not understand well the importance of using PPE during work [7]. The use of PPE masks is sometimes still lowered to the chin or removed for a moment, this is included in the category of not complying with the correct use of PPE masks [8]. Whereas PPE masks are used to protect workers' breathing from exposure to dust during work activities. Lack of worker compliance in the use of PPE masks greatly affects the occurrence of respiratory disorders [9]. Therefore, it is necessary to increase the safety and discipline of workers in using PPE properly and correctly, so as to reduce the risk of danger during work [10].

PT. Alba Unggul Metal is one of the manufacturing industries that manages raw materials in the form of steel plates into products such as Steel Office Furniture and Steel Doors. In the process of managing these materials, it is possible that there are work activities that have a high risk of occupational diseases such as welding and painting workers who have a potential risk of exposure to dust during work activities. According to preliminary results conducted by researchers to 20 workers in the welding and paint shop at PT. Alba Unggul Metal, it was observed that most of the workers did not wear PPE optimally while working. Based on interviews conducted by researchers, half of the workers who have worked for more than 10 years often experience complaints in the form of cough, flu, sore throat, headache, fever, chills, chest pain, and shortness of breath.

Looking at the preliminary study data above, although there have been many studies that have examined compliance with the use of PPE with the incidence of Occupational Diseases (PAK), there are still limited previous studies related to the relationship between compliance with the use of PPE with the incidence of ARI in manufacturing work, so further studies are needed on the relationship of compliance with the use of PPE with the incidence of ARI in welding and painting workers at PT. Alba Unggul Metal.

## 2 Material and Method

Research is quantitative with a cross sectional study approach with an analytical observational design. The duration of the implementation of this research in February—April 2022. Determination of the research sample by total sampling, so that the total population involved in the research sample is 33 workers from the welding and paint shop at PT. Alba Unggul Metal. The dependent variable in this study was the incidence of ARI, while the independent variable in this study was adherence to the use of PPE.

The instrument in this study was a questionnaire which included the characteristics of the respondents, the application of workers in compliance with the use of PPE, and the incidence of ARI by asking the symptoms of ARI that had been experienced by workers. The test of this research questionnaire is in the form of validity and reliability tests, where the value of the validity test results of more than 0.631 is declared valid. Meanwhile, the value of the reliability test results is 0.850 which means the instrument is reliable or consistent. In addition, this research has passed the ethical clearance with certificate number 167/HRECC.FODM/IV/2022.

Data retrieval in this study by filling out a questionnaire conducted by workers in the welding and painting section starting from the respondent's characteristics questionnaire, then continued with a worker compliance questionnaire in the use of PPE. And the next questionnaire is the complaints related to ARI. Univariate analysis in the study to obtain a frequency distribution table. Bivariate analysis with Spearman to determine whether there is a relationship between compliance with the use of PPE with the incidence of ARI at PT. Alba Unggul Metal.

### **3 Result and Discussion**

#### **3.1 Result**

##### **3.1.1 Characteristics of Respondents**

The results of this study were conducted on workers in the welding and painting department at PT. Alba Unggul Metal. According to the Table 1, the characteristics of the largest respondents in the age group of 25–35 years are 39.4.1%. In terms of education status, more than half of the respondents have a high school education level of 69.7%. Respondents as much as 42.3% have a working period of 1 to 10 years. Almost all respondents did not have a history of respiratory disease as much as 90.9%. Smoking habits of respondents as many as 78.8% of respondents have a habit of smoking every day with a smoking intensity of 57.6% of respondents classified as light smokers.

##### **3.1.2 Compliance with PPE Use**

Respondents' compliance with PPE use was categorized into compliant and non-compliant. Almost most of the respondents fall into the non-compliant category of 57.6% with a total of 19 respondents. Respondents of 42.4% were included in the obedient category as many as 14 people (Table 2).

##### **3.1.3 Incidence of Acute Respiratory Infection (ARI)**

Incidence of acute respiratory infection (ARI) in respondents categorized as having had ARI and never ARI. Most of the respondents, 69.7%, were categorized as having had ARI as many as 23 people. Respondents of 30.3% were categorized as never having ARI as many as 10 people (Table 3).

**Table 1.** Characteristics of respondents.

Age	Frequency (n)	Percentage (%)
17–25 years	2	6.1
26–35 years	13	39.4
36–45 years	11	33.3
46–55 years	7	21.2
Total	33	100
Education	Frequency (n)	Percentage (%)
Elementary school	3	9.1
Junior high school	7	21.2
Senior high school	23	69.7
Total	33	100
Working Mass	Frequency (n)	Percentage (%)
1–10 years	14	42.3
11–20 years	10	30.4
21–30 years	7	21.3
31–40 years	2	6.0
Total	33	100
History of Respiratory Disease	Frequency (n)	Percentage (%)
No	30	90.9
Lung Spots, ARI	1	3.0
ARI	1	3.0
Bronchitis	1	3.0
Total	33	100
Smoking Habits	Frequency (n)	Percentage (%)
Yes	26	78.8
No	7	21.2
Total	33	100
Classification of Smokers	Frequency (n)	Percentage (%)
Light	19	73.1
Smokers Medium	6	23.1
Smokers Heavy	1	3.8
Smokers	26	100
Total		

### 3.1.4 The Correlation Between Compliance with the Use of PPE with the Incidence of ARI

Based on the results of the analysis of compliance with the use of PPE with the incidence of ARI, it was found that half of the respondents were not compliant in wearing PPE and had experienced ARI of 51.5% with 17 respondents, while respondents who complied using PPE and did not find ARI were 24.2% with 8 respondents. In addition, the results of the *Spearman* show the correlation coefficient is  $-0.501$  with a significant number

**Table 2.** Compliance with PPE.

Compliance with PPE Use	Frequency (n)	Percentage (%)
Compliant	14	42.4
Not Compliant	19	57.6
Total	33	100

**Table 3.** Incidence of ARI.

Incidence of ARI	Frequency (n)	Percentage (%)
Ever	23	69.7
Never	10	30.3
Total	33	100

**Table 4.** The correlation between compliance with the use of PPE with the incidence of ARI.

Compliance with PPE Use	Incidence Of ARI				Total		Correlation Coefficient	Sig.
	Ever ARI		Never ARI		n	%		
	n	%	n	%				
Compliant	6	18.2	8	24.2	14	42.4	-0.501	0.003
Not Compliant	17	51.5	2	6.1	19	57.6		
Compliant Total	23	69.7	10	30.3	33	100		

of 0.003, meaning that there is a relationship between compliance with the use of PPE with the incidence of ARI at PT. Alba Unggul Metal (Table 4).

### 3.2 Discussion

The results of testing the variable of compliance with the use of personal protective equipment with the incidence of ARI were carried out using statistical analysis of the *Spearman* which showed a correlation coefficient of  $-0.501$ , meaning that the two variables had a fairly strong relationship with the relationship between the two variables was not unidirectional. The significant number is 0.003, where the figure is less than 0.05 which means there is a relationship between compliance with the use of PPE with the incidence of ARI at PT. Alba Unggul Metal. The results of this study are in line with previous studies which explained that workers who did not wear PPE masks felt uncomfortable and interfered with work activities. Workers who do not wear PPE masks have a 9800 times risk of experiencing ARI indications than workers who wear PPE masks during work [11].

Based on Sirait's research on the relationship between the use of PPE and ARI disease among rice factory workers, it was stated that most of the workers who did not wear PPE had experienced ARI disease, this was because workers were uncomfortable using PPE [12]. In line with Sururi's research on the relationship between the use of PPE masks and the subject of respiratory infections in *furniture* field of wood sanding, CV Bella-Bella, Jepara Regency, explained that *furniture* who do not wear PPE masks during work often experience flu, fever, sore throat, and shortness of breath [3].

Personal protective equipment (PPE) is a tool that is used at work to protect the safety of workers and others from hazards in the workplace [13]. Also, the use of PPE can prevent work accidents and occupational diseases [14]. Workers who do not comply with the use of PPE can be caused by internal factors and external factors, where internal factors include individual behavior, while external factors come from the workplace environment [15]. The use of PPE is expected to create a sense of security and comfort for workers while working, so as to increase worker productivity [16]. In addition, compliance with the use of PPE by workers is very influential in carrying out the K3 culture in the workplace [17]. Workers who use PPE masks during work are expected to protect workers from respiratory problems, where PPE masks can reduce the number of particles, thereby minimizing the amount of dust exposure inhaled by workers during work activities [18].

Acute Respiratory Infection is an acute inflammatory disease of the upper and lower respiratory tract [19]. The severity of ARI depends on the causative pathogen, environmental factors, and other supporting factors [20]. ARI disease is usually characterized by complaints such as: cough, flu, sore throat, headache, fever, chills, chest pain, and shortness of breath, where ARI complaints start from mild symptoms to severe symptoms [21]. ARI disease in workers is caused by exposure to dust during work activities. Dust is part of many environmental factors that can cause respiratory problems [22]. Dust has a small particle size where dust can be inhaled by workers into the respiratory tract. Exposure to dust during work activities can cause dust accumulation in the lungs, this can lead to respiratory problems [23].

The dust generated from the welding process is very small, about  $< 1$  micron, where the dust can be formed from the presence of a heated metal process [24]. Meanwhile, the dust produced in the painting process comes from the sprayed material, causing fine particles that can be very easily inhaled into the respiratory tract [25]. Inhaled dust particles can cause acute effects, namely respiratory tract infections, this is based on the level of intensity and exposure to workers during work activities. Workers with a longer working mass are longer exposed to dust and have a higher risk of getting ARI [26]. The effects of dust exposure depend on the dose or concentration, location and time of exposure. Exposure time is defined as the frequency or duration of exposure to dust, so the longer the exposure time, the higher the potential for interference, especially if supported by high concentrations of the exposure substance [27].

It can be concluded that, theoretically, the level of worker compliance in wearing PPE can be related to the incidence of ARI disease, this also applies to workers in the welding and painting sector at PT. Alba Unggul Metal. Based on the results of monitoring carried out by researchers, most of the workers in the welding and welding department are less than optimal in wearing PPE masks and face shields or welding shields during

operation. This study is in line with Nurriqzi's study which explains that if furniture workers who do not wear PPE have the effect of impaired lung function and respiratory problems (ARI), this is due to the absence of PPE masks provided by the furniture party. The use of PPE masks is able to minimize dust exposure to sawmill and wood sanding workers [28]. This is in line with Sampouw's research which explains that the higher the use of PPE masks, the lower the incidence of ARI in workers [29].

Worker compliance in the use of PPE at PT. Alba Unggul Metal is still lacking because workers are still not up to standard in using PPE masks, where in use they are still unplugged during work, and workers feel less comfortable in using PPE *face shields*. Workers sometimes do not use PPE if the intensity of work is light, this causes workers to become accustomed to not using PPE during work, so workers are easily exposed to dust during work activities. Continuous exposure to dust will risk the occurrence of ARI or respiratory problems. For this reason, the use of masks and *face shields* is very important in protecting the respiratory system of workers, where masks can minimize exposure to inhaled dust by filtering methods, so that the air passing through the mask becomes clean of particulates [30].

## 4 Conclusion

Based on the results of the study, it is known that there is a relationship between compliance with the use of PPE with the incidence of ARI among workers in the welding and painting sector at PT. Alba Unggul Metal. Prevention efforts, use of PPE masks and face shields correctly and safely to minimize dust exposure during work activities, so as to increase work productivity. The limitation in this research is that there is no measurement of dust levels in the welding and painting section, so it is hoped that further research can be carried out in terms of chemical hazard factors in the work environment related to the incidence of ARI at PT. Alba Unggul Metal.

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