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Factors Associated with the Incidence of Acute Respiratory Infections Among Employees at Tanjung Priok Regional General Hospital in 2025

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Acute Respiratory Infection (ARI) is an acute infectious disease affecting one or more parts of the respiratory tract, ranging from the nose to the alveoli, including its adnexal tissues. Several factors influencing the incidence of ARI among employees include age, smoking habits, use of personal protective equipment (PPE) masks, temperature, humidity, and family history of ARI. This study aimed to determine the association between age, smoking habits, PPE mask use, temperature, humidity, and family history of ARI with the incidence of ARI among employees at Tanjung Priok Regional General Hospital in 2025. This research employed a quantitative approach using a cross-sectional study design. The study population consisted of all employees at Tanjung Priok Regional General Hospital, totaling 252 individuals. The sample size was determined using a two-proportion hypothesis test formula, resulting in 96 respondents. Stratified random sampling was applied as the sampling technique. Data processing and analysis were conducted using the Chi-Square test. The results showed a significant association between family history of ARI (p = 0.005) and the incidence of ARI among employees. Meanwhile, there were no significant associations between age (p = 0.346), smoking habits (p = 0.768), PPE mask use (p = 0.387), temperature (p = 0.329), and humidity (p = 0.942) with the incidence of ARI among employees at Tanjung Priok Regional General Hospital.
Keywords: Acute Respiratory Infection, Age, Smoking Habits, PPE Mask, Temperature, Humidity, Family History of ARI

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1. Introduction

Hospitals are one of the healthcare facilities that provide promotive, preventive, curative, and rehabilitative services. In their implementation, hospitals have various occupational hazards, particularly biological exposure that can increase the risk of occupational diseases among employees. One of the diseases that frequently occurs is Acute Respiratory Infection (ARI), which is an infectious disease affecting the respiratory tract from the nose to the alveoli and may cause symptoms ranging from mild to severe. ARI transmission generally occurs through droplets, aerosols, and close contact with infected individuals.

Globally, ARI remains one of the leading causes of morbidity and mortality. Data from the World Health Organization (WHO) indicate that lower respiratory tract infections cause millions of deaths each year. In Indonesia, based on the Indonesian Health Survey (SKI) in 2023, the national prevalence of ARI reached 23.5%, with the Province of DKI Jakarta recording 22.6%. These figures indicate that ARI remains a significant public health problem, including among workers in healthcare facilities.

The incidence of ARI among workers is influenced by various factors, including individual and environmental factors. Individual factors include age and smoking habits, while workplace environmental factors include temperature, humidity, and the use of personal protective equipment (PPE) masks. In addition, external factors such as a family history of ARI also contribute to increasing the risk of transmission due to close

contact within the household environment. Several previous studies have shown that inconsistent use of PPE, smoking habits, and exposure to high-risk work environments can increase the incidence of ARI among workers.

Data from the employee clinic at RSUD Tanjung Priok showed that the prevalence of ARI among employees during the June–August 2025 period exceeded 40%, with fluctuating but consistently high trends. Transitional seasonal conditions causing changes in temperature and humidity were suspected to further worsen the situation. The high incidence of ARI has led to increased employee absenteeism and has the potential to reduce productivity as well as the quality of hospital services.

Based on this background, research is needed to analyze the factors associated with the incidence of ARI among employees. This study aimed to determine the relationship between age, smoking habits, the use of PPE masks, temperature, humidity, and family history of ARI with the incidence of ARI among employees at RSUD Tanjung Priok in 2025. The results of this study are expected to serve as a basis for planning ARI prevention and control programs in efforts to improve occupational health within the hospital environment.

2. Literature Review and Problem Statement

Literature Review

Acute Respiratory Infection (ARI) is an infectious disease that attacks the respiratory tract, ranging from the upper respiratory tract to the alveoli, and remains a major public health concern worldwide. According to the World Health Organization, respiratory tract infections are among the leading causes of morbidity and mortality globally, particularly in developing countries. ARI transmission commonly occurs through droplets, aerosols, and direct contact with infected individuals, making healthcare facilities high-risk environments for disease transmission. Hospitals, as healthcare service providers, expose employees to various occupational hazards, especially biological hazards originating from patients, contaminated surfaces, and airborne pathogens. Therefore, healthcare workers are considered one of the vulnerable occupational groups for ARI exposure.

Several studies have identified multiple factors associated with the incidence of ARI among workers. Individual factors such as age and smoking habits are frequently associated with respiratory health disorders. Noor (2008) explained that increasing age may reduce physiological and immune system function, thereby increasing susceptibility to infectious diseases, including ARI. In addition, smoking behavior contributes to respiratory tract inflammation and impairs mucociliary clearance due to exposure to toxic substances contained in cigarettes. Previous studies conducted by Purnamasari (2016) and Ayu (2021) also discussed the relationship between smoking behavior, age, and respiratory disorders among workers.

Environmental and occupational factors also play important roles in ARI occurrence. Temperature and humidity are environmental indicators closely related to indoor air quality and microorganism survival. Based on the Regulation of the Indonesian Ministry of Health Number 48 of 2016, inappropriate workplace temperature and humidity may increase the risk of respiratory disorders and microbial growth. Furthermore, the use of Personal Protective Equipment (PPE), particularly masks, is recognized as an important preventive measure against respiratory infection transmission in healthcare settings. According to the Indonesian Ministry of Health (2021), proper and consistent mask use can reduce exposure to infectious droplets and aerosols. However, several previous studies reported inconsistent findings regarding the effectiveness of PPE use and environmental conditions on ARI incidence among workers.

Family-related factors are also considered important determinants of ARI transmission. Household environments involve prolonged and repeated close contact among family members, increasing the possibility of infection transmission. Fitriah et al. (2022) stated that family history of ARI significantly contributes to ARI incidence because household transmission may occur continuously when preventive behaviors are not optimally implemented. This condition indicates that ARI prevention should not only focus on occupational exposure but also consider domestic environmental factors.

Problem Statement

Despite the implementation of occupational health and safety measures in hospitals, the incidence of Acute Respiratory Infection among healthcare employees remains relatively high. Data from the employee clinic at RSUD Tanjung Priok showed that the prevalence of ARI among employees during the June–August 2025 period exceeded forty percent, indicating that ARI continues to be a significant occupational health problem within the hospital environment. Seasonal changes affecting temperature and humidity, combined with individual and household-related factors, may contribute to the persistence of ARI cases among employees.

Previous studies have examined several determinants of ARI, including age, smoking habits, workplace environmental conditions, and PPE use. However, findings from earlier studies remain inconsistent, particularly regarding the influence of workplace temperature, humidity, and PPE compliance on ARI incidence among healthcare workers. In addition, limited studies have simultaneously examined individual, environmental, and family-related factors among hospital employees in Indonesia, especially in government hospitals.

Therefore, this study was conducted to analyze the factors associated with the incidence of ARI among employees at RSUD Tanjung Priok in 2025. The study specifically investigated the relationship between age, smoking habits, PPE mask use, temperature, humidity, and family history of ARI with the incidence of ARI among hospital employees. The findings are expected to provide scientific evidence for developing effective ARI prevention and occupational health improvement programs within hospital settings.

3. Method

This study employed a quantitative research approach using a cross-sectional study design to identify factors associated with the incidence of Acute Respiratory Infection (ARI) among employees at RSUD Tanjung Priok in 2025. The cross-sectional approach was considered appropriate because it allows the researcher to assess the relationship between several independent variables and ARI incidence simultaneously within a specific period of time.

The study was conducted from November to December 2025 at RSUD Tanjung Priok. The research population consisted of all hospital employees, totaling 252 individuals from various working units. The sample size was determined using a two-proportion hypothesis formula, resulting in 96 respondents who met the study criteria. To ensure proportional representation from different work divisions, the study applied a stratified random sampling technique. This sampling method was chosen to minimize sampling bias and to provide equal opportunities for respondents from each stratum to participate in the study.

The dependent variable in this study was the incidence of ARI among employees. Meanwhile, the independent variables included age, smoking habits, use of personal protective equipment (PPE) masks, workplace temperature, workplace humidity, and family history of ARI. Data collection was carried out using structured questionnaires distributed directly to respondents, supported by secondary data obtained from hospital records and employee health reports. The questionnaire was designed to collect information related to demographic characteristics, smoking behavior, PPE use, and family medical history.

Environmental measurements, including temperature and humidity, were obtained from workplace observations and supporting hospital environmental monitoring data.

The collected data were processed and analyzed through several stages, including editing, coding, entry, and data cleaning to ensure completeness and accuracy before statistical analysis was performed. Univariate analysis was conducted to describe the distribution and characteristics of each variable using frequencies and percentages. Furthermore, bivariate analysis was performed using the Chi-Square test to examine the relationship between independent variables and the incidence of ARI among employees. The level of statistical significance was determined at a confidence level of 95 percent.

This study emphasized research ethics throughout the data collection process. Respondents were informed about the objectives of the study and participated voluntarily after providing consent. Confidentiality and anonymity of respondents' information were maintained to protect participants' privacy and ensure ethical research implementation within the hospital setting.

4. Results and Discussion

Univariate Analysis

Table 1. Frequency Distribution of ARI Incidence, Age, Smoking Habits, PPE Mask Use, Temperature, Humidity, and Family History of ARI Among Employees at RSUD Tanjung Priok in 2025

Variable	Frequency (n)	Percentage (%)
ARI Incidence		
ARI	32	33.30%
Non-ARI	64	66.70%
Age		
≥35 Years	43	44.80%
<35 Years	53	55.20%
Smoking Habits		
Smoking	14	14.60%
Non-Smoking	82	84.50%
Use of PPE Masks		
Not Using PPE	29	30.20%
Using PPE	67	69.80%
Temperature		
Abnormal	5	5.20%
Normal	91	94.80%
Humidity		
Abnormal	46	47.90%
Normal	50	52.10%
Family History of ARI		
Having a Family History of ARI	34	35.40%
No Family History of ARI	62	64.60%

The data presented in Table 1 indicate that the highest proportion for the ARI incidence variable was found among employees who did not experience ARI, accounting for 64 employees (66.7%). Most respondents were categorized as non-risk age (<35 years), totaling 53 employees (55.2%). The majority of respondents were non-smokers, with 82 employees (84.5%), and most employees reported using PPE masks, accounting for 67 employees (69.8%). In terms of environmental conditions, most workspaces had normal

temperature conditions, totaling 91 units (94.8%), while normal workplace humidity was observed in 50 units (52.1%). In addition, the majority of employees reported having no family history of ARI, accounting for 62 individuals (64.6%).

Bivariate Analysis

Table 2. Analysis of the Relationship Between Age, Smoking Habits, PPE Mask Use, Temperature, Humidity, and Family History of ARI with the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

Variable	ARI		Non-ARI		Total		P-Value	PR (95% CI)
	n	%	n	%	n	%		
Age								
≥ 35 Years	17	39.5	26	60.5	43	100	0.346	1.397 (0.793–2.460)
< 35 Years	15	28.3	38	71.7	53	100		
Smoking Habits								
Smoking	4	28.6	10	71.4	14	100	0.768	0.837 (0.347–2.019)
Non-Smoking	28	34.1	54	65.9	82	100		
Use of PPE Masks								
Not Using PPE	12	41.4	17	58.6	29	100	0.387	1.389 (0.786–2.446)
Using PPE	20	29.9	47	70.1	67	100		
Temperature								
Abnormal	3	60	2	40	5	100	0.329	1.883 (0.866–4.091)
Normal	29	31.9	62	68.1	91	100		
Humidity								
Abnormal	16	34.8	30	65.2	46	100	0.942	1.087 (0.617–1.913)
Normal	16	32	34	68	50	100		
Family History of ARI								
Having a Family History of ARI	18	52.9	16	47.1	34	100	0.005	2.345 (1.340–4.102)
No Family History of ARI	14	22.6	48	77.4	62	100		

The data presented in Table 2 indicate that there was a significant relationship between family history of ARI and the incidence of ARI among employees (p = 0.005). Meanwhile, no significant relationships were found between age (p = 0.346), smoking habits (p = 0.768), use of PPE masks (p = 0.387), temperature (p = 0.329), and humidity (p = 0.942) with the incidence of ARI among employees at RSUD Tanjung Priok in 2025.

Discussion

Relationship Between Age and the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

Based on the analysis results, there was no significant relationship between age and the incidence of Acute Respiratory Infection (ARI) among employees at RSUD Tanjung Priok in 2025 (p-value > 0.05). This finding indicates that statistically, age was not associated with ARI incidence in this study. The result is consistent

with the study conducted by Ayu (2021) among workers at PT WIKA, which also reported no significant relationship between age and ARI incidence. These findings suggest that among working populations, age is not always the primary determinant of ARI occurrence because the disease may be influenced by various other factors, including individual characteristics and workplace environmental conditions.

Theoretically, Noor (2008) explained that increasing age may lead to a decline in physiological function and immune system performance, thereby increasing susceptibility to infectious diseases, including ARI. This concept is consistent with the risk analysis results showing that older employees had a 1.397 times greater risk of experiencing ARI compared to younger employees (PR = 1.397), although the relationship was not statistically significant. This increased risk may be explained by the gradual decline in immune response associated with aging, as well as the possibility of longer cumulative exposure to infectious agents within the hospital environment. Therefore, although the statistical association was not significant, the direction of the relationship remains consistent with epidemiological theories of infectious diseases.

Relationship Between Smoking Habits and the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

The analysis results showed that there was no significant relationship between smoking habits and the incidence of ARI among employees at RSUD Tanjung Priok in 2025 (p-value > 0.05). Statistically, smoking behavior was not proven to be associated with ARI incidence in this study. This finding is in line with the study by Purnamasari (2016), which also found no association between smoking habits and ARI complaints among workers at PT Paper Tbk. The Indonesian Ministry of Health (2025) stated that smoking is one of the main risk factors for respiratory disorders because cigarette smoke contains toxic substances capable of damaging lung tissue, impairing mucociliary defense mechanisms, and increasing susceptibility to infection.

Within the hospital environment, the implementation of smoke-free area policies limits smoking activities during working hours, thereby reducing continuous exposure to cigarette smoke in the workplace. This condition may influence the level of smoke exposure experienced by employees in occupational settings. Although the relationship was not statistically significant, risk analysis demonstrated that employees who smoked had a 1.195 times greater risk of developing ARI compared to non-smokers (PR = 1.195). Biologically, nicotine, tar, and carbon monoxide contained in cigarettes can cause respiratory tract inflammation, damage respiratory epithelial cilia, and weaken the immune response against infection. Thus, even though the statistical relationship was not significant, the direction of increased risk remains consistent with theories regarding the adverse effects of smoking on respiratory health.

Relationship Between PPE Mask Use and the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

The findings revealed that there was no significant relationship between the use of personal protective equipment (PPE) masks and the incidence of ARI among employees at RSUD Tanjung Priok in 2025 (p-value > 0.05). This result is consistent with the study conducted by Rahayu (2020), which also reported no significant association between PPE use and ARI incidence among workers at PT Persero Tbk. Statistically, mask use in this study was not proven to have a significant association with ARI occurrence. This condition may be influenced by relatively good compliance with mask use in the hospital environment, variations in the types of masks used, hospital mask supply policies, and other more dominant factors such as individual immunity, exposure outside the workplace, and household contact history.

According to the Indonesian Ministry of Health (2021), proper and consistent use of masks can reduce the risk of exposure to droplets and aerosols that serve as transmission media for ARI because masks function

as barriers against infectious particles entering the respiratory tract. Although the statistical test did not show significance, the risk analysis demonstrated that respondents who did not use masks had a 1.389 times greater risk of experiencing ARI compared to those who used masks (PR = 1.389). Theoretically, failure to use masks increases the likelihood of exposure to infectious droplets. Therefore, the observed direction of increased risk remains consistent with infectious disease prevention theories concerning the use of personal protective equipment, despite the lack of statistical significance.

Relationship Between Temperature and the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

Based on the analysis results, no significant relationship was identified between workplace temperature and the incidence of ARI among employees at RSUD Tanjung Priok in 2025 (p-value > 0.05). This result is in agreement with the study by Purnamasari (2016), which also found no relationship between temperature and ARI complaints among workers at PT Paper Tbk. Statistically, workplace temperature in this study was not proven to have a significant relationship with ARI incidence. This finding may be attributed to relatively controlled and standardized room temperature conditions within the hospital, supported by regulated air conditioning systems and adequate ventilation, which minimized extreme temperature variation between workspaces. In addition, other factors such as individual immunity, exposure to infectious agents outside the workplace, and the intensity of interaction among employees may have contributed more substantially to ARI occurrence than room temperature alone.

Based on the Regulation of the Indonesian Ministry of Health Number 48 of 2016, healthy workplace temperature standards range from 18–30°C, and temperatures outside this range may increase the risk of health disturbances. Although the statistical analysis was not significant, the risk analysis indicated that employees working in abnormal temperature conditions had a 1.883 times greater risk of experiencing ARI compared to those working under normal temperatures (PR = 1.883). Theoretically, excessively low temperatures may cause vasoconstriction in the respiratory tract and reduce mucosal defense effectiveness, whereas excessively high temperatures may induce physiological stress that affects immune resistance (Yenita, 2017). Therefore, although not statistically significant, the observed increase in risk remains consistent with occupational environmental health theories.

Relationship Between Humidity and the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

The analysis results demonstrated that there was no significant relationship between workplace humidity and the incidence of ARI among employees at RSUD Tanjung Priok in 2025 (p-value > 0.05). This finding is consistent with the study conducted by Purnamasari (2016), which reported no association between humidity and ARI complaints among workers at PT Paper Tbk. Statistically, workplace humidity was not proven to be significantly associated with ARI incidence in this study. This condition may be influenced by relatively controlled humidity levels that remained within acceptable health standards, supported by adequate ventilation systems and air conditioning that maintained stable indoor humidity. Additionally, factors such as individual immunity, frequency of patient contact, and exposure to infections outside the workplace may have contributed more strongly to ARI incidence than humidity alone.

According to the Regulation of the Indonesian Ministry of Health Number 48 of 2016, healthy workplace humidity should range between 40–60%, while humidity levels outside this range may increase the growth of disease-causing microorganisms. Although statistical significance was not observed, risk analysis showed that employees working under abnormal humidity conditions had a 1.087 times greater risk of experiencing ARI compared to those exposed to normal humidity levels (PR = 1.087). The World Health Organization (2009) stated that excessively high humidity can support the growth of airborne

microorganisms, whereas excessively low humidity may cause dryness of the respiratory mucosa and reduce natural defense mechanisms against infection. Therefore, although the increase in risk was relatively small and statistically insignificant, the direction of the relationship remains consistent with environmental health theories related to indoor air quality.

Relationship Between Family History of ARI and the Incidence of ARI Among Employees at RSUD Tanjung Priok in 2025

The analysis results indicated a significant relationship between family history of ARI and the incidence of ARI among employees at RSUD Tanjung Priok in 2025. This finding is consistent with the study conducted by Fitriah et al. (2022), which demonstrated that a family history of ARI was strongly associated with ARI incidence. These findings confirm that family environmental factors play an important role in increasing ARI risk because household transmission may occur repeatedly when preventive measures are not implemented optimally. The family environment involves frequent interaction and prolonged duration of contact among household members, thereby increasing the potential for infection transmission.

Theoretically, ARI is an infectious disease that is easily transmitted through droplets and close contact. According to the Indonesian Ministry of Health (2021), the household environment is one of the primary locations for ARI transmission due to the high frequency of interaction among family members, shared use of household facilities, and suboptimal implementation of clean and healthy living behaviors. The analysis results showed that employees with a family history of ARI had a 2.345 times greater risk of experiencing ARI compared to those without such a history (PR = 2.345). This relatively high prevalence ratio indicates that family history of ARI is a strong risk factor for ARI incidence. Therefore, preventive measures within household environments are essential for breaking the chain of disease transmission.

5. Conclusion

This study concludes that Acute Respiratory Infection remains an important occupational health concern among employees at RSUD Tanjung Priok. The findings indicate that the majority of respondents did not experience ARI, were categorized within the non-risk age group, did not smoke, consistently used personal protective equipment in the form of masks, worked under normal temperature and humidity conditions, and had no family history of ARI. These conditions reflect that most employees were generally exposed to relatively controlled workplace environmental conditions and preventive health measures within the hospital setting. The results of the study demonstrate that family history of ARI was significantly associated with the incidence of ARI among hospital employees. This finding emphasizes that household transmission and close interaction among family members remain important determinants of respiratory infection transmission. Employees who had family members with a history of ARI were more vulnerable to experiencing similar respiratory health problems due to prolonged contact and repeated exposure within the household environment. Therefore, ARI prevention efforts should not only focus on occupational exposure in healthcare facilities but also consider preventive strategies within family and domestic environments. Meanwhile, age, smoking habits, the use of PPE masks, workplace temperature, and workplace humidity were not significantly associated with ARI incidence in this study. Nevertheless, these variables still demonstrated a tendency toward increased risk and remain theoretically relevant as contributing factors to respiratory disorders. Consequently, continuous health promotion, environmental monitoring, proper use of personal protective equipment, and implementation of clean and healthy living behaviors are still necessary to support occupational health protection and reduce the potential transmission of ARI among healthcare workers.

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