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The Relationship between Physical Environmental Conditions of Dormitories and Acute Respiratory Tract Infections (ARTI) at MAN 3 Palembang City in 2026

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Abstract. *Acute Respiratory Tract Infection (ARTI) remains a common ailment in dormitory settings. Substandard physical environmental conditions within dormitories can increase the risk of ARTI among residents. Environmental factors suspected to be associated with ARTI incidence include ventilation, air temperature, occupancy density, lighting, and humidity. This study aimed to determine the relationship between the physical environmental conditions of the dormitory and the incidence of ARTI among students at the MAN 3 Palembang City Dormitory in 2026. A quantitative method with a cross-sectional design was employed. The study was conducted from January to June 2026 at the MAN 3 Palembang City Dormitory, involving a sample of 83 respondents selected via Simple Random Sampling. Data were collected through observation, direct measurement of the dormitory's physical environmental conditions, and interviews using a checklist. Data analysis was performed using the Chi-Square test with a 95% confidence level. The results showed that out of the 83 respondents, 30 (36.1%) suffered from ARTI, while 53 (63.9%) did not. Bivariate analysis revealed no significant relationship between ARTI incidence and ventilation (p=1.000), occupancy density (p=0.201), or humidity (p=1.000). However, a significant relationship was found between lighting and ARTI incidence (p=0.004), air temperature and ARTI incidence (p=0.016). Lighting and air temperature was identified as a physical environmental factor associated with ARTI incidence, whereas ventilation, occupancy density, and humidity did not show a significant relationship with ARTI incidence.*

Keywords *: Acute Respiratory Track Infections (ARTI); Dormitory Physical Environment; Lighting; Ventilation*

1. Introduction

Acute Respiratory Track Infection (ARTI) is an infectious disease affecting the respiratory tract that remains a global public health issue due to its high transmission rate, particularly via droplets and aerosols in crowded, enclosed environments. Globally, the 2019 Global Burden of Disease (GBD) study reported that acute respiratory track infections. Specifically lower respiratory tract infections, which represent a severe manifestation of ARTI—accounted for approximately 488.9 million new cases and contributed to around 2.4 million deaths annually worldwide, making them a leading cause of morbidity and mortality among infectious diseases (1) (2). The burden of ARTI is particularly high in low-and middle-

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income countries and among vulnerable age groups such as children and adolescents, especially those living in communal settings like school dormitories.

Reports from the South Sumatra Provincial Health Office indicate that, as of August 2025, there were 331,064 ARTI cases across the province, with Palembang City recording the highest number approximately 92,913 cases (3). By September 2025, the total number of ARTI cases in South Sumatra had risen to approximately 390,354, with the highest concentrations found in Palembang City, Muara Enim, Banyuasin, and Musi Banyuasin. These high and rising case numbers demonstrate that ARTI remains a health issue requiring attention and suggest that environmental factors and individual behaviors play a role in the disease's spread (4).

Physical environmental conditions such as housing density, poor ventilation, indoor air quality, and pollution exposure can increase the risk of ARTI in enclosed environments. Poor ventilation and exposure to indoor air pollution are significantly associated with an increase in symptoms and the incidence of acute respiratory track infections; consequently, residential environmental conditions are a crucial risk factor to consider in school dormitories (5) (6). School dormitories are characterized by shared sleeping quarters, communal kitchens, and frequent group activities, resulting in residents spending extended periods in high-density, enclosed spaces. Inadequate ventilation and air circulation, poor lighting, and high occupancy density can increase the likelihood of transmission via droplets and aerosols. Substandard ventilation and high occupancy density in living quarters are also linked to a high incidence of respiratory tract infections in dormitory and communal living environments (7) (8).

MAN 3 Palembang City was selected as the research site because it provides dormitory facilities for students, specifically female students in grade 10 and above. Data indicates that Acute Respiratory Track Infections (ARTI) represent the most common illness at MAN 3 Palembang City, with 110 recorded cases in 2025. This high incidence suggests that respiratory health remains a concern within the school environment and may be linked to both physical environmental conditions and individual behaviors. However, empirical data regarding the relationship between the physical environment of the dormitory and the incidence of ARTI among residents remains limited. This situation highlights the need to specifically examine the physical environmental factors of the dormitory to inform ARTI prevention efforts.

However, empirical data regarding the relationship between the physical environment of the dormitory and the incidence of ARTI among residents remains limited. This situation highlights the need to specifically examine the physical environmental factors of the dormitory to inform ARTI prevention efforts. From an environmental health perspective, improving indoor environmental quality in shared student housing is an important component of healthier built environments and preventive environmental sanitation, as adequate ventilation, lighting, thermal comfort, humidity control, and occupancy conditions may reduce environmental health risks associated with respiratory track infections. Improving these environmental factors can support healthier built environments and respiratory disease prevention (9)(10). Given these issues, this study aims to analyze the relationship between the physical environmental conditions of the dormitory and the incidence of ARTI at MAN 3 Palembang City in 2026.

2. Methods

This study employs a descriptive-analytic method with a cross-sectional approach. It was conducted at MAN 3 Palembang City between January and June 2026. The study population consisted of all 336 Grade X students residing in the MAN 3 Palembang City dormitory, including both male and female students accomodated in separate dormitory buildings. A sample of 83 students was determined using the Lemeshow formula, with a 10% addition to account for potential dropouts. Sampling was carried out using a simple random sampling technique via a random draw using a spin/random picker application. Participats were then randomly selected until the required sample size of 83 students was reached. All eligible students had an equal probability of being selected regardless of sex or dormitory building. The dependent variable in this study is the incidence of Acute Respiratory Track Infection (ARTI), while the independent variables are the physical environmental conditions of the dormitory, comprising ventilation, temperature, humidity, lighting, and occupancy density.

Data collection was performed through direct observation and measurement using checklists, measuring tapes, thermohygrometers, and lux meters. Primary data included ARTI status was determined using a structured checklist. Respondents were asked about ARTI-related symptoms during the previous two weeks, including cough, runny nose or nasal congestion, sore throat, fever, and shortness of breath. Respondents reporting three symptoms were classified as having ARTI, and Information regarding previous ARTI diagnoses from school health records or healthcare was collected as secondary. Environmental measurements were conducted in 17 dormitory rooms consisting of 8 female rooms and 9 male rooms. Ventilation area and room floor area were measured using a measuring tape and were classified as meeting the standard when it area was ≥ 10%. Temperature and relative humidity were measured using a thermohygrometer with temperature standard at <18°C or >30°C while humidity was categorized meeting the standard at 40-60%. Lighting intensity was measured using lux meter and was classified as meeting the standard when it was ≥ 60 lux. Occupancy density was calculated based on floor area per occupant and was categorized as meeting the standard when the area per occupant was ≥ 8 m^2. Because environmental measurements were conducted at the room level, all students residing in the same room were assigned the same environmental exposure classification based on the measurement result of their respective dormitory room.

The collected data underwent editing, coding, processing, cleaning, and tabulation. Data analysis was conducted using SPSS software, comprising univariate analysis to describe respondent characteristics, physical environmental conditions, and ARTI incidence, as well as bivariate analysis using the chi-square test to determine the relationship between the dormitory's physical environmental conditions and the incidence of ARTI. This study has received approval from the ethics committee DP.04.03/F.XXXII.10/3504/2026.

3. Results and Discussion

3.1 Results

A total of 83 dormitory residents participated in this study. The results are presented in terms of respondent characteristics, dormitory physical environmental conditions, Acute Respiratory Track Infection (ARTI) incidents by age and gender is presented in Table 1.

Table 1. Frequency Distribution of Dormitory Resident Characteristics at MAN 3 Palembang

Variable	Category	Number (n)	Percentage (%)
Age	15 years old	32	38,6
	16 years old	51	61,4
Gender	Male	43	51,8
	Female	40	48,2

As shown in Table 1, the majority of respondents were 16 years old (61.4%) and male (51.8%). The distribution of physical environmental conditions in the dormitory rooms at MAN 3 Palembang in 2026 is presented in Table 2.

Table 2. Frequency Distribution of the Physical Environmental Conditions of the Dormitory at MAN 3 Palembang in 2026

Variable	Category	Number (n)	Percentage (%)
Ventilation	Not eligible	23	27,7
	Qualify	60	72,3
Temperature	Not eligible	45	54,2
	Qualify	38	45,8
Occupancy density	Not eligible	52	63,7
	Qualify	31	36,3
Lighting	Not eligible	45	54,2
	Qualify	38	45,8
Humidity	Not eligible	58	69,9
	Qualify	25	30,1

As shown in Table 2, the physical environment of the dormitory mostly met the standards for ventilation (72.3%). Conversely, air temperature (54.2%), occupancy density (63.7%), lighting (54.2%), and humidity (69.9%) largely failed to meet the standards. The distribution of Acute Respiratory Track Infection (ARTI) cases among respondents at MAN 3 Palembang in 2026 is presented in Table 3.

Table 3. Frequency Distribution of ARTI Cases at MAN 3

Incidence of ARTI	Number (n)	Percentage (%)
Experience ARTI	30	36,1
Did not experience ARTI	53	63,9
Total	83	100

As shown in Table 3, 30 respondents (36.1%) students had an Acute Respiratory Track Infection (ARTI), while 53 respondents (63.9%) did not experience ARTI. Bivariate analysis was performed to determine of the relationships between respondent characteristics, dormitory physical environmental condistions, and ARTI incidence presented in Table 4 .

Table 4. Relationship between Respondent Characteristics, Physical Environmental Conditions of the Dormitory, and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Variable	Category	ARTI (%)	No ARTI (%)	Total n (%)	*p-value*	OR
Age	15 years old	13 (15,7)	19 (22,9)	32 (38,6)	0,661	–
	16 years old	17 (20,5)	34 (41,0)	51 (61,4)		
Gender	Male	13 (15,7)	30 (36,1)	43 (51,8)	0,350	–
	Female	17 (20,5)	23 (27,7)	40 (48,2)		
Ventilation	Not eligible	8 (9,6)	15 (18,1)	23 (27,7)	1,000	–
	Qualify	22 (26,5)	38 (45,8)	60 (72,3)		
Temperature	Not eligible	22 (26,5)	23 (27,7)	45 (54,2)	0,016	*3,587*
	Qualify	8 (9,6)	30 (36,1)	38 (45,8)		
Occupancy density	Not eligible	22 (26,5)	30 (36,1)	52 (62,7)	0,201	–
	Qualify	8 (9,6)	23 (27,7)	31 (37,3)		
Lighting	Not eligible	23 (27,7)	22 (26,5)	45 (54,2)	0,004	*4,630*
	Qualify	7 (8,4)	31 (37,3)	38 (45,8)		
Humidity	Not eligible	21 (25,3)	37 (44,6)	58 (69,9)	1,000	–
	Qualify	9 (10,8)	16 (19,3)	25 (30,1)		

As shown in Table 4, there is no significant association between age, gender, ventilation, occupancy density, or humidity and the incidence of acute respiratory track infections (ARTI) (*p-value* > 0.05). Conversely, air temperature (*p-value* = 0.016; OR = 3.587) and lighting (*p-value* = 0.004; OR = 4.630) show a significant association with the incidence of ARTI. Respondents in rooms where temperature and lighting do not meet standards have a higher likelihood of developing ARTI compared to those in conditions that meet the standards.

3.2. Discussion

3.2.1 Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Research findings indicate that Acute Respiratory Track Infections (ARTI) are still prevalent among students residing in the MAN 3 Palembang dormitory. Based on interviews and checklist data, the most frequently reported symptoms include coughing, runny nose, sore throat, fever, and mild shortness of breath. Other complaints, such as headaches and sleep disturbances, were also observed, primarily due to coughing at night. These findings demonstrate that ARTI remains a health issue requiring attention within the dormitory environment.

ARTI can affect individuals across all age groups, from children to adults. It is classified as an infectious disease that spreads rapidly; if not properly managed, it can escalate into a severe condition and even lead to death (11). Therefore, addressing ARTI requires sustained prevention and management efforts through the adoption of clean and healthy living habits and the creation of an environment that meets health standards. The occurrence of the disease is heavily influenced by individual habits regarding personal hygiene and the cleanliness of the living environment (12).

These conditions may be linked to personal hygiene practices and dormitory characteristics that facilitate transmission. Communal living and shared spaces increase the

likelihood of contact with and exposure to the agents that cause ARTI. Beyond behavioral factors, physical environmental conditions—such as occupancy density, ventilation, humidity, and lighting—also contribute to the incidence of ARTI (13).

3.2.2 The Relationship Between Age and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Age is defined as the duration of time calculated from birth to the moment of measurement or study. In epidemiology, age is a crucial variable that is almost invariably analyzed, as it can influence the incidence of various diseases (14).

The study results indicate no significant association between age and the incidence of Acute Respiratory Track Infections (ARTI) among students at MAN 3 Palembang. This suggests that age differences within the respondent group were not a differentiating factor regarding ARTI incidence. The relatively narrow age range of the respondents likely resulted in similar characteristics regarding activities, living environments, and interaction patterns while residing in the dormitory. Consequently, the incidence of ARTI in this study is more likely linked to dormitory environmental factors or other individual characteristics. Efforts to prevent ARTI need to be implemented comprehensively across all dormitory residents, rather than focusing on specific age groups.

3.2.3 The Relationship Between Gender and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Gender is a trait defined by physiological and biological characteristics, as well as attitudes and behaviors, used to distinguish differences (15). Research findings indicate that gender has no significant association with the incidence of Acute Respiratory Track Infections (ARTI) among students at MAN 3 Palembang; in other words, gender differences among the respondents did not result in a statistically significant disparity in ARTI incidence. This situation may be attributed to the shared living environment and similar activities undertaken by students within both the school and dormitory settings. The absence of an association suggests that ARTI prevention strategies in the dormitory environment should target all residents, regardless of gender. Maintaining personal hygiene, environmental cleanliness, and the physical condition of dormitory rooms remains crucial to mitigating factors that could facilitate ARTI transmission.

3.2.4 The Relationship Between Ventilation and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Ventilation refers to openings in a building that facilitate the inflow and outflow of air, thereby maintaining indoor air circulation. According to the Regulation of the Minister of Health of the Republic of Indonesia Number 1077/Menkes/Per/V/2011 regarding Guidelines for Indoor Air Sanitation in Homes, ventilation area must constitute at least 10% of the floor area to meet health standards. Inadequate ventilation can impede air exchange, leading to increased indoor humidity and creating conditions conducive to the growth of various disease-causing microorganisms (16) (17).

Research results indicate that ventilation area does not have a significant association with the incidence of Acute Respiratory Track Infections (ARTI). This finding suggests that ventilation conditions alone cannot explain the occurrence of ARTI among the respondents. Although ventilation plays a role in air exchange, the effectiveness of air circulation is also influenced by building conditions, the placement of openings, occupancy density, and other

physical environmental factors. Nevertheless, meeting ventilation requirements remains important as part of efforts to create a healthy dormitory environment. Preventing ARTI requires considering ventilation alongside other environmental factors, such as temperature, lighting, humidity, and occupancy density.

3.2.5 The Relationship Between Air Temperature and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

The study results indicate a relationship between air temperature and the incidence of Acute Respiratory Track Infections (ARTI) among students at MAN 3 Palembang. Inappropriate room temperatures can affect occupant comfort and the indoor environment. Unsuitable temperatures can also alter indoor air conditions, potentially creating an environment that fosters the presence and proliferation of microorganisms.

This study aligns with research conducted by (18), which suggests that indoor air temperature and humidity must be maintained at levels conducive to human comfort to ensure a healthy environment. An ideal room temperature helps maintain the body's thermal balance, preventing excessive heat loss or temperature increases that could cause discomfort.

Conversely, temperatures outside the normal range can create conditions that promote the growth and development of various microorganisms.

These findings indicate that room temperature control is a crucial aspect of dormitory environmental management. Regulating air circulation, optimizing ventilation, and minimizing factors that raise room temperatures are measures that can help maintain an environment conducive to the health of the occupants.

3.2.6 The Relationship Between Residential Density and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Housing density is an environmental factor that can influence disease transmission, particularly for airborne illnesses such as acute respiratory track infections (ARTI). The higher the number of occupants in a home, the greater the likelihood of disease-causing microorganisms spreading from one individual to another. Consequently, this increases the risk of ARTI transmission (19).

However, research findings indicate that housing density is not significantly associated with the incidence of ARTI among students at MAN 3 Palembang. This suggests that housing density is not a primary factor directly differentiating ARTI incidence among the study's respondents. Other factors involved in transmission—such as occupant behavior, room cleanliness, air circulation, and the physical condition of the rooms—may play a role.

Despite the lack of a significant association, housing density remains a factor that warrants attention in dormitory management. Regulating the number of occupants according to room capacity and ensuring proper cleanliness and air circulation can help create a healthier living environment.

3.2.7 The Relationship Between Lighting and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

Lighting is a crucial component in creating a healthy home. Indoor light intensity must be at an adequate level—neither too low nor excessive. Rooms lacking natural light—particularly sunlight—can foster the growth and proliferation of various disease-causing microorganisms, such as bacteria and parasites, while also diminishing occupant comfort.

Research findings indicate a link between lighting conditions and the incidence of Acute Respiratory Track Infections (ARTI). This suggests that room lighting is an environmental aspect requiring attention, as poor lighting often reflects limited natural light penetration. Such conditions may create an environment that fails to support occupant health, especially when compounded by other environmental factors. Therefore, optimizing natural light entry into dormitory rooms can serve as a strategy for creating a healthier living environment.

3.2.8 The Relationship Between Humidity and the Incidence of Acute Respiratory Track Infections (ARTI) at MAN 3 Palembang in 2026

According to the Regulation of the Minister of Health of the Republic of Indonesia Number 1077/MENKES/PER/V/2011 regarding guidelines for indoor air sanitation in homes, the required indoor humidity level is 40–60% RH. Observations revealed varying humidity levels across rooms, influenced by the specific location and structural characteristics of each room. The room with the highest humidity was situated in a corner and contained an attached bathroom. Risk factors contributing to high humidity included non-waterproof walls, leaking roofs, and the obstruction of direct sunlight by adjacent buildings (20).

The study results indicate no significant association between humidity levels and the incidence of Acute Respiratory Track Infections (ARTI) among students at MAN 3 Palembang. These findings suggest that the observed variations in dormitory room humidity cannot statistically explain the differences in ARTI incidence. Such outcomes may be influenced by the interplay between humidity and other environmental factors—such as temperature, ventilation, lighting, building conditions, and occupant behavior (21).

Despite the absence of a significant association, humidity levels still require management, as improper humidity conditions can compromise indoor air quality. Maintaining room conditions, repairing structural areas prone to water ingress, and optimizing air circulation and lighting are measures that can be taken to ensure a healthy dormitory environment (22).

Conclusion

Based on the research findings, it can be concluded that the proportion of Acute Respiratory Track Infection (ARTI) cases among students at MAN 3 Palembang was 36.1%. Univariate analysis revealed that the majority of respondents suffering from ARTI were 16 years old and female. Assessments of the physical environment at the MAN 3 Palembang dormitory indicated that most parameters—specifically ventilation area, air temperature, occupancy density, lighting, and humidity—did not meet the required standards. Bivariate analysis showed a significant association between air temperature, lighting, and the incidence of ARTI at MAN 3 Palembang; however, no such association was found regarding age, gender, ventilation area, occupancy density, or humidity.

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Conflicts of Interest

The authors declare no conflict of interest.

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