Conference Paper

Relationship between Physical Environment and Smoking Behaviour with Accute Respiratory Infection in Class-I Correctional Institutions in Lowokwaru, Malang

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Abstract

Many prisoners experience Accute Respiratory Infection (ARI), and as many as 5,000 new cases are reported every year. This is generally caused by the prisoners' inadequate physical environment and smoking behaviour. This observational analytical study was conducted using a cross-sectional design over a duration of two months, from December 2019 to January 2020. The independent variables in this study included occupancy density, ventilation, temperature, humidity, lighting and prisoners' smoking behaviour on a nominal scale, while the dependent variable included the incidence of ARI with a nominal scale. A total of 96 prisoners who were positive for ARI and visited the Class-1 Prison Clinic of Lowokwaru, Malang were selected using the sampling estimation method. While a univariate analysis was used to explain the characteristics of each variable in the study, a bivariate analysis was done to determine the relationship between the independent and dependent variables using the contingency coefficient test. The results of the study indicated that there was a significant relationship between the occupancy density, ventilation, temperature, humidity and lighting, and the incidence of ARI, but no significant relationship was noted between the prisoners' smoking behaviour and the incidence of ARI in Class-1 prisons of Lowokwaru, Malang.

Keywords: physical environment, smoking behaviour, ARI

1. Introduction

The main problems and often occur are health problems related to the physical environment, and the current state of the prison is overcapacity (overcrowding) and inadequate physical environmental conditions. According to data obtained from the correctional *database* system in September 2019, there are 3,109 residents in the Class I Prison of Lowokwaru Malang [1]. As a result, there was an *over capacity* of 232% [2]. This condition

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can cause new problems that occur in prisons, especially in health problems. Based on the initial *study* conducted by the author on November 5, 2019, information was obtained about the 5 highest diseases in Class I Lowokwaru Malang Prison including skin diseases such as (*scabies* , dermatitis), ARI, toothache, hypertension and other diseases such as (dizziness, *fractures* , diarrhoea). For ARI diseases throughout 2019 from January to October which have been recorded in the clinical visit book of the Class I Lowokwaru Malang Prison, totalling 5,463 cases . Based on the description of the problem above, it is explained that the density of occupancy, ventilation, air quality, lighting and smoking behaviour are factors that influence the occurrence of ARI disease. So that the authors are interested in conducting research on these problems. The research entitled "The Relationship between Physical Environmental Conditions and Smoking Behaviour with the incidence of ARI in Class 1 Lapas Lowokwaru Malang".

2. Material and Method

This research is a descriptive observational analytic study. This study aims to determine the relationship between environmental conditions and smoking behaviour with the incidence of ARI. The design used in this study is cross-sectional, this design is to determine the cause and effect variables of cases that occur in the object of research which are measured and collected at the same time [3] . The population in this study were all prisoners who came to visit the prison clinic and tested positive for ARI from December 2019 to January 2020 at the Class 1 Prison in Lowokwaru Malang. Determination of the sample using sample estimation, due to not knowing the population, the sample estimate for the *cross sectional study* of [4] Lameslow et al., Obtained a research sample of 96 samples, which are prisoners inmates of Class 1 Lowokwaru Malang prisons who were positive for ARI during the study period this. The sampling technique used in this study was *quota sampling* by determining the number of samples in advance or setting a *quotum* (quota) [4]. Then the ration is used as the basis for sampling, if the number of samples is met, then no more sampling can be done. Basis for taking n data in this study using interviews related to the smoking behaviour of inmates who tested positive for ISPA. Observations to be made include occupancy density, ventilation, temperature, humidity and lighting.

3. Results

3.1. Characteristics of respondents

All respondents that participated in this study were male (100%). The majority of them were late teen (42.7%) and 29.2 of them were early adult. It indicated that most of them were classified as productive age group. Based on the room or block that was occupied in the prison, most of respondents came from block C (32.3%). Almost a half of total respondents (41.7%) had graduated from senior high school. Their employment status was mostly entrepreneur (55.2%). All respondents were active smoker. Majority of them were a light smoker (53.1). The characteristics of respondent could be seen in Table 1.

TABLE 1: Distribution of respondent's characteristics.

Variable	Number (n)	Percentage (%)
Sex		
Male	96	100
Female	0	0
Age		
Late teen	41	42.7
Early adult	28	29.2
Late adult	17	17.7
Early elderly	7	7.3
Late elderly	3	3.1
Room (block)		
A	15	15.6
B	27	28.1
C	31	32.3
D	23	24
Educational level		
Primary school	24	25
Junior high school	28	29.2
Senior high school	40	41.7
Higher education	4	4.2
Employment		
Farmer	26	27.1
Entrepreneur	53	55.2
Civil servant	4	4.2
Student	1	1
Others	12	12.5
Smoking behaviour		
Light	51	53.1
Moderate	36	37.5
Heavy	9	9.4

Source: Author's own work.

3.2. Characteristics of physical environment

Table 2 showed the physical environment measurements of the rooms that were occupied by the respondents. The floor area of a room in one room is divided by the number of occupants of 1 prison room with the criteria, fulfilling the requirements if the room area is 5,4 m^2 for one occupant and does not meet the requirements if the room area is < 5,4 m^2 for one occupant. A total of 86 respondents did not meet the requirements and 10 people met the requirements, it means that the density of occupancy in the Class 1 Prison of Lowokwaru Malang mostly did not meet the requirements (densely occupied). The room ventilation of respondents in this study was divided into two categories, namely <10% of the floor area and ≥ 10% of the floor area. A total of 86 respondents experienced room ventilation that did not meet the requirements and as many as 10 respondents met the requirements, so that the occupancy ventilation in the Class 1 Prison in Lowokwaru Malang mostly did not meet the requirements. The temperature in the respondent's residence meets the requirements if it is between 18 ^{o}C to 30 ^{o}C. There are 86 respondents whose occupancy temperature does not meet the requirements and 10 respondents who meet the requirements. So that the temperature in the room of the prisoners' residence in the Class 1 Correctional Institution of Lowokwaru Malang mostly does not meet the requirements. The humidity in the room of the respondent meets the requirements if it is between 40% - 70%. There were 86 respondents whose occupancy humidity did not meet the requirements and there were 10 respondents who met the requirements. So that most of the occupancy humidity of prisoners in the Class 1 Correctional Institution of Lowokwaru Malang does not meet the requirements. It was found that the lighting in the prisoner's residence was around 60 lux. There were 86 respondents whose occupancy lighting did not meet the requirements and there were 10 respondents who met the requirements. So that most of the residential lighting in the Class 1 Lowokwaru Malang Correctional Institution does not meet the requirements.

3.3. Bivariate analysis

Based on the bivariate analysis, the physical environment had a significant association with ARI (p-value < 0.05). It included occupancy density, ventilation, temperature, humidity, and lighting of the rooms that were occupied by the respondents. All those indicators were associated with the incidence of ARI in the prison. Smoking behaviour did not showed a significant association with the incidence of ARI (p-value 0.814). The result of bivariate analysis could be seen in Table 3.

TABLE 2: Distribution of physical environment characteristics and smoking behaviour.

Variable	Number (n)	Percentage (%)
Occupancy density		
Standard	86	89.6
Nonstandard	10	10.4
Ventilation		
Standard	86	89.6
Nonstandard	10	10.4
Temperature		
Standard	86	89.6
Nonstandard	10	10.4
Humidity		
Standard	86	89.6
Nonstandard	10	10.4
Lighting		
Standard	86	89.6
Nonstandard	10	10.4

Source: Author's own work.

4. Discussion

4.1. Relationship between prison occupancy density and ARI

The results of the bivariate test analysis showed a significance value (*p-value)* of 0.001 smaller than the significance level (α) that has been determined in this study, which is 0.05 . The test decision obtained by Ho was rejected, which means that there is a relationship between occupancy density and the incidence of ARI in the Class 1 Prison, Lowokwaru Malang. This is due to the occupancy available with the inmates who occupy it not in accordance with the Ministry of Law and Human Rights (2009) resulting in overcrowding of residents. If the density of the occupancy does not meet the requirements, it can result in the availability of oxygen in the room which is not well fulfilled, resulting in high room temperature and humidity which can cause the growth of disease germs to grow well and facilitate the occurrence of disease transmission both directly and indirectly, especially respiratory diseases.

This research is also in line with research conducted by Taha & Ryzdayani (2018), that the hot steam produced by the breathing of each occupant is not circulating properly and can also cause a lack of oxygen consumption for each occupant in it, if one occupant is infected with an infectious diseases it will be very easy to infect other residents [5].

TABLE 3: Relationship between independent variables and ARI.

Variable	ARI				P-value
	Yes		Not		
	n	%	*n*	%	
Occupancy density					
Nonstandard	85	91.3	1	33.3	0.001
Standard	8	8.8	2	66.7	
Ventilation					
Nonstandard	85	91.3	1	33.3	0.001
Standard	8	8.8	2	66.7	
Temperature					
Standard	85	91.3	1	33.3	0,001
Nonstandard	8	8.8	2	66.7	
Humidity					
Standard	85	91.3	1	33.3	0.001
Nonstandard	8	8.8	2	66.7	
Lighting					
Standard	85	91.3	1	33.3	0.001
Nonstandard	8	8.8	2	66.7	
Smoking behaviour					
Light	49	52.6	2	66.7	0.814
Moderate	35	37.6	1	33.3	
Heavy	9	9.7	0	0	

Source: Author's own work.

This is also consistent with study conducted by Ahyanti & Duarsa (2013) that residential density is a factor of ARI [6].

The results of research conducted by Firnanda et al., (2017) explain that if a person lives in a densely populated environment, it can result in the risk of transmission of a very fast disease including ARI [6]. This is also supported by Chen et al., (2014), that occupancy density is a risk factor for acute respiratory disease (ARI) [7].

4.2. Relationship between ventilation and ARI

The results of the bivariate test analysis obtained a significance value (*p-value*) of 0.001 which is smaller than the significance level (α) that has been determined in this study, which is 0.05. The test decision obtained by Ho was rejected, which means that there is a relationship between ventilation and the incidence of ARI in the Class 1 Prison of Lowokwaru Malang. This means that if a dwelling has adequate ventilation and meets standards, the air circulation in the room can remain good and quality is maintained,

because the air can circulate every day so that germs that cause diseases, especially respiratory diseases such as ARI can be reduced. This is in accordance with the research conducted by Wulandhani & Purnamasari (2019) that ventilation is associated with the incidence of ARI [8].

Previous research conducted by Putri & Mantu (2019), if it has insufficient ventilation, it can cause the lack of toxic oxygen to increase in the room and can cause the humidity of the room to become high due to the process of evaporation of liquid from the skin and its absorption is blocked. Lack of ventilation can cause the exchange of air flow and sunlight from outside the room into the bedroom to be obstructed, making it easier for bacteria that cause ARI disease to grow properly [9].

The statement was in line with the results of research conducted ole h Fitriyah, (2016), that if a room with a ventilation is not good or do not meet the standards and is inhabited by humans, it can cause health disorders, especially disorders penrnapasan, poor ventilation, it can lead to humidity in the room becomes ascended [10]. This is also in line with research conducted by Popow-Kraupp & Aberle (2011) that the diagnosis of ARI can be caused by ventilation [11].

4.3. Relationship between temperature and ARI

The results of the bivariate test analysis obtained a significance value (*p-value*) of 0.001 which is smaller than the significance level (α) that has been determined in this study, which is 0.05. The test decision obtained by Ho was rejected, which means that there is a relationship between temperature and the incidence of ARI in the Class 1 Prison, Lowokwaru Malang. This is in accordance with research conducted by [12], the temperature in the room greatly affects the health of family members who inhabit it, if the temperature in the dwelling is low it can cause the growth of bacteria that cause disease to reproduce properly.

Previous research conducted by Juniartha et al., (2014) states that there are several factors that can influence the occurrence of ARI, namely the physical condition of the place of residence, cleanliness, occupancy density, indoor air pollution, ventilation, temperature and lighting in a place of residence affect the occurrence of ARI [13]. This statement is also supported by research conducted by Ardianto & Yudhastuti, (2012) that the room temperature in the residence can affect the occurrence of ARI disease [14].

This statement is also supported by research conducted by Soolani et al., (2015), which states that temperature is a risk factor that can affect the occurrence of ARI

disease [15]. This is also supported by a study conducted by [16], that temperature has an effect on the emergence of acute respiratory infections.

4.4. Relationship between humidity and ARI

The results of the bivariate test analysis showed a significance value (*p-value*) of 0.001 smaller than the significance level (α) that has been determined in this study, which is 0.05. The test decision obtained by Ho was rejected, which means that there is a relationship between humidity and the incidence of ARI in the Class 1 Prison in Lowokwaru Malang. This is in accordance with the research conducted by Nurhayati & Vera (2019), that a humid occupancy allows animals that cause disease to live in them, such as rats and cockroaches that carry bacteria and viruses, all of which can act as the occurrence of respiratory diseases, humidity in the air house is a good medium for the growth of bacteria that cause ARI [17].

Previous research conducted by Supit et al. (2016) stated that where humidity has an active role in the process of spreading *microorganisms* in the living environment, if you have a place to live with a low humidity level, it is very easy to overgrow by various germs and bacteria that cause an infectious disease, especially ARI [18] .

This statement is also supported by research conducted by [19], that humidity is one of the risk factors that can cause ARI disease, this is also supported by research conducted by Jalil et al., (2018) that low humidity levels can cause the body is easily dehydrated, which triggers a disease, especially respiratory disease [20].

4.5. Relationship between lighting and ARI

The results of the bivariate test analysis obtained a significance value (*p-value*) of 0.001 which is smaller than the significance level (α) that has been determined in this study, which is 0.05. The test decision obtained by Ho was rejected, which means that there is a relationship between lighting and the incidence of ARI in the Class 1 Prison in Lowokwaru Malang. This is in line with a study conducted by [21], this lighting is related to ventilation because if the ventilation is lacking, it is rarely opened during the day, does not have home ventilation, it can cause less sunlight to enter the room which can cause the air temperature to be low, humidity increases and so it can cause the growth of pathogenic bacteria in the house which can cause health problems, especially breathing.

Previous research conducted by [22], stated that lighting is associated with the occurrence of ARI disease. This statement is also supported by research conducted by Syam & Ronny (2016), that insufficient lighting can prolong the life span of germs in the air [23]. This is also supported by research conducted by Suryani et al., (2015), that there is a significant relationship between natural and artificial lighting on the occurrence of ARI disease [24].

This statement is also in line with research conducted by Saleeby et al., (2011), that lighting can affect the occurrence of Respiratory Infections (ARI), both natural lighting and artificial lighting [25].

4.6. Relationship between inmates' smoking behaviour and ARI

The results of the bivariate test analysis obtained a significance value (*p-value*) of 0.814 which is greater than the significance level (α) that has been determined in this study, which is 0.05. The test decision obtained by Ho is accepted, which means that there is no relationship between smoking behaviour and the incidence of ARI in the Class 1 Correctional Institution, Lowokwaru Malang. This is also in line with research conducted by Wahyuningsih et al., (2017), which states that there is no relationship between smoking behaviour and the incidence of ARI.

Previous research was also conducted by Imasari et al., (2019), that there was no significant relationship between smoking behaviour and the incidence of ARI even though cigarette smoke has a danger to breathing [27]. This statement is also in line with research conducted by Widodo et al., (2016), which states that the smoking behaviour of families who live in the house has nothing to do with the incidence of ARI [28]. This statement is also supported by research conducted by [29], that smoking behaviour is not associated with the occurrence of Acute Respiratory Infections (ARI).

5. Conclusion

This study found that there was a relationship between occupancy density, ventilation, temperature, humidity, lighting, and the incidence of acute respiratory infections in the Class 1 Correctional Institution, Lowokwaru Malang, but it was not found that inmates smoking behaviour was associated with the incidence of acute respiratory infections.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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