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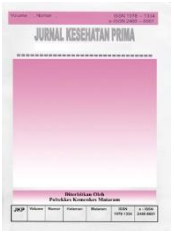

Factors Associated with the Incidence of Tuberculosis

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Abstract

Tuberculosis, also known as TB, is an infectious disease caused by the bacterium Mycobacterium tuberculosis, which the bacterium can not only attack the lungs but also attack other organs such as carbuncles, skin, meningitis, lymph nodes, intestines, and other people. The transmission originates when the patient sneezes or coughs so that the germs spread through the air in the form of sputum. This study aims to determine the factors that influence the incidence of Tuberculosis in the work area of the Bengkulu Pasar Ikan Market Health Center. This type of research is quantitative with a cross-sectional approach. The research was conducted at the Fish Market Health Center in Bengkulu City from November 25 to December 24, 2022. The research sample was taken from 64 people using a purposive sampling technique. Data analysis was carried out by univariate and bivariate analysis using the chi-square test with $\alpha = 0.05$. The study's results showed an influence between age, knowledge, attitudes, gender, smoking habits, ventilation, occupancy density, humidity, and lighting related to the incidence of Tuberculosis.

Keywords: Tuberculosis;Host;Environment

INTRODUCTION

Tuberculosis is an infectious disease caused by the bacterium Mycobacterium tuberculosis. The source of transmission is when the patient sneezes or coughs, thus spreading the germs into the air in the form of sputum droplets (droplet nuclei/sprinkles) (Latif et al., 2023).

According to the WHO Global Tuberculosis Report, the urgency of the tuberculosis (TB) problem is evident, with an estimated 10 million people worldwide expected to be affected by 2020, causing 1.2 million deaths each year. Shockingly, only 67% of these cases are identified and treated, leaving 283,000 TB patients untreated and at risk of spreading the disease. (WHO Global TB Report, 2021)

Tuberculosis (TB) is a global health problem that has long plagued many countries, including Indonesia. In response, the government has committed to eradicating Tuberculosis by 2030. This ambitious goal can only be achieved through collaborative efforts. Indonesia has made significant strides in TB prevention, particularly in improving access to TB health services. The National Strategic Plan for 2016-2020 for TB Control, which outlines key strategies for increasing knowledge, access, and treatment success, is a testament to the collective

action of all service providers, TB patients, and the community. This plan is in line with the global TB Elimination strategy in 2030 (Kemenkes RI, 2019).

According to (Latif et al., 2023), the risk factors for Tuberculosis are bacteria that cause TB, individual factors concerned, and environmental factors. According to research (Togatorop, 2021), smoking habits, nutritional status, income, occupancy density, ventilation, and contact history influence tuberculosis incidence. Meanwhile, according to Zifodya's research, the factors influencing tuberculosis incidence are education, knowledge and attitudes, occupancy density, lighting, humidity, ventilation, walls, and house floor (Zifodya et al., 2021).

Based on data from the Bengkulu City Ministry of Health in 2020, the number of pulmonary tuberculosis cases in Bengkulu City in 2017 was 633 cases; in 2018, there was an increase of 912 cases; in 2019, there was an increase of 977 cases. In 2020, the number of cases decreased by 339 cases (Dinas Kesehatan Kota Bengkulu, 2020)

Based on data from the Pasar Ikan Health Center, 2019 there were 23 cases of tuberculosis sufferers, 18 people in 2020, 2021 in 2021, and 21 people, and there was an increase in 2022, namely 39 cases. (Puskesmas pasar ikan, 2022)

METHOD

The type of research used is quantitative with an analytic method, a cross-sectional approach whose goal is to find out Factors Influencing Tuberculosis Incidence at the Pasar Ikan Health Center. This research was conducted for 1 month, with the location of the work area of the Bengkulu City Pasar Ikan Health Center. The population of this study is every patient who visits and is also recorded in the medical records at the Pasar Ikan Health Center from January 2022 to July 2022.

In this research, 64 samples were taken using purposive sampling techniques, including exclusion and inclusion criteria.

This study's independent variables were age, knowledge, attitudes, gender, smoking habits, ventilation, occupancy density, humidity, and lighting. The dependent variable was the incidence of Tuberculosis.

Data is processed in several stages: entry, coding, editing, and cleaning. The data was analyzed using descriptive statistics and univariate and bivariate data analysis. Univariate data analysis was carried out to determine the frequency distribution of the respondents. Furthermore, the analysis was used to describe each dependent and independent variable. Bivariate analysis determined the relationship between the dependent and independent variables.

. The result of the statistical test is to find out whether the Ho test is rejected. If the value of $P < \alpha$ (0.05), Ho is rejected, meaning it has a significant relationship. If the P-value $> \alpha$ (0.05), Ho is accepted, meaning no significant relationship exists between variables.

RESULT AND DISCUSSION

Univariate data analysis was performed for each research variable. The research analysis included each category of variables: age, knowledge, attitudes, gender, smoking habits, ventilation, occupancy density, humidity, lighting, and the incidence of Tuberculosis.

Table 1 Respondent frequency distribution

Characteristic	Group	N	%
Invident Tb	Tuberculosis	32	50,0
	No tuberculosis	32	50.0
Age	Productive (15-64 age)	48	75,0
	Non Productive (≥65age)	16	25,0
Gender	Man	35	54,7
	Woman	29	45,3
Knowledge	Good	17	26,6
	Enough	12	18,8
	Not enough	35	54,7
Attitude	Negative	37	57,8
	Positive	27	42,2
Smoking habit	Smoke	33	51,6
	Not Smoke	31	48,4
Occupancy density	Not Eligible	18	28,1
	Qualify	46	71,9
Ventilation	Not Eligible	17	26,6
	Qualify	47	73,4
Humidity	Not Eligible	23	35,9
	Qualify	41	64,1
Lighting	Not Eligible	28	43,8
	Qualify	36	56,3

Table 1 shows that in this study, 64 respondents were divided into two groups, namely 32 tuberculosis patients as the case group and 32 non-TB sufferers as the control group. Productive age (15-64 years), namely 48 people (75.0%), and non-productive age (≥65 years), namely 16 people (25.0%). Respondents whose gender was male were 35 people (54.7%), who were female were 29 respondents (45.3%). Those who have good knowledge are 17 people (26.6%), those who have sufficient knowledge are 12 people (18.8%), then those who have less knowledge are 35 people (54.7%). Respondents had a negative attitude of 37 people or 57.8%, with a positive attitude of 27 people or 42.2%. Respondents had smoking habits, totaling 33 people or 51.6%. Those who did not smoke were 31 people or 48.4%

Table 2
Distribution of Respondents Who Smoke by Level Category
Smokers in the Working Area of the Pasar Ikan Health Center

Amount smoked in one day	Tuberculosis		No tuberculosis		Total	
	N	%	N	%	N	%
Heavy (> 20 stem)	10	58,8	7	41,2	17	100,0
Current (11-20 stem)	11	73,3	2	15,4	13	100,0
Light (1-10 stem)	2	66,7	1	33,3	3	100,0
Total	23	88,2	10	11,8	33	100,0

Based on the two above, it shows that the majority of respondents who are categorical smokers are patients with TB, with as many as 11 respondents (73.3%)

Table 3
Distribution of Respondents Who Smoke Based on duration of smoking
In the Work Area of the Pasar Ikan Health Center

Long smoking	Tuberculosis		No tuberculosis		Total	
	N	%	N	%	N	%
>10 age	17	73,9	5	22,7	22	100,0
≤ 10 age	6	50,0	5	45,5	11	100.0
Total	23	100,0	2	100,0	35	100,0

Based on table 3 above shows that most of the respondents who had smoked for > 10 years had TB, as many as 17 people (73.9%).

Table 4.1 shows that 18 people (28.1%) have apprehensive or inadequate housing conditions, and 46 people (71.9%) have decent or fulfilling housing densities. Respondents who had house ventilation that did not meet the requirements were 17 people (26.6%), who had house ventilation that complied with the requirements were 47 respondents (73.4%). There were 23 people (35.9%) who did not comply with the requirements for house humidity, and 41 people (64.1%) who had house humidity that met the requirements. Respondents with home lighting conditions that did not comply with the requirements were 28 people (43.8%) with home lighting conditions that met the requirements, namely 36 people (53.3%).

The objective of the bivariate analysis was to determine the effect of the independent variables, namely age, gender, knowledge, attitude, smoking habits, contact history, occupancy density, ventilation, humidity, and lighting, with the dependent variable, namely non-TB patient.

Table 4 Results of bivariate analysis between the variables age, gender, knowledge, attitude, smoking habits, density of occupancy, ventilation, humidity, and exposure to the incidence of Tuberculosis

Variable	Tuberculosis		No tuberculosis		Total		*P*
	N	%	N	%	N	%	
Age							
Productive	19	39,6	29	60,4	38	100,0	0,009
Non produktif	13	81,3	3	18,8	16	100,0	
Gender							
Man	23	65,7	12	34,3	35	100,0	0,012
Woman	9	31,0	20	69,0	29	100,0	
Knowledge							
Good	7	41,2	10	57,1	17	100,0	0,009
Enough	2	16,7	10	77,8	12	100,0	
Not enough	23	65,7	12	18,8	35	100,0	
Attitude							
Negative	24	64,9	13	35,1	37	100,0	0,011
Positive	8	29,6	19	70,4	27	100,0	
Smoking							
Smoke	23	65,7	10	30,3	33	100.0	0,003
Not smoke	9	31,0	22	71,0	31	100,0	
Occupancy density							
Not eligible	14	77,8	4	22,2	18	100.0	0,012
Qualify	18	39,1	28	60,9	46	100,0	
ventilation							
Not eligible	13	76,5	4	22,2	17	100.0	0,024
Qualify	19	40,4	28	60,9	47	100,0	
Humidity							
Not eligible	17	73,9	6	26,1	23	100.0	0,009
Qualify	15	36,6	26	63,4	41	100,0	
Lighting							
Not eligible	20	71,4	8	28,6	28	100.0	0,006
Qualify	12	33,3	24	66,7	36	100,0	
Total	32	50,0	32	50,0	64	100,0	

The relationship between age and the incidence of Tuberculosis in the Work Area of the Pasar Ikan Health Center

The results showed that out of 64 respondents, 48 (75.0%) were productive pulmonary TB (15-64 years), and 16 people (25.0%) were unproductive (≥65 years). The statistical test results obtained p>0.009 because p<0.05 means a significant relationship exists between age and tuberculosis incidence in the working area of the Pasar ikan Health Center.

The group that is most vulnerable to contracting TB is the young adult age group th, the productive age group (Latif et al., 2023). This is because the older a person is, the immune system will also weaken, which causes them to be susceptible to diseases, especially Tuberculosis (Productive age is a very vulnerable age (Huang et al., 2025).

Tuberculosis because at that age, they have high mobility so that they can transmit it to other people. Around 75% of pulmonary tuberculosis sufferers in Indonesia are in the productive age group, between 15 to 50 years (Sari et al., 2024). At this productive age, many work as laborers and are in direct contact with the outside environment, so many people at this age are sick with Tuberculosis (Ruditya, 2015)

The results of this study were adjusted to previous research conducted at the Tegal Sari Medan Denai Health Center using Chi-Square; it was known that the P value = 0.007 indicated an influence between age and the age of the work area. Tegalsari Health Center. It is known that of 19 pulmonary TB patients of childbearing age (15-58 years), 6 of them had pulmonary TB of childbearing age (58 years) (Sikumbang et al., 2022)

The relationship between gender and the incidence of Tuberculosis in the working area of the Pasar Ikan Health Center

The results showed that of the 64 respondents, 35 (54.7%) were male, and 29 (37.5%) were female. The statistical test results obtained p>0.012 because p<0.05 means a significant relationship exists between gender and the incidence of Tuberculosis in the work area of the Pasar ikan Health Center.

Based on the results of the TB prevalence survey, more men have TB than women (Latif et al., 2023). The mobility and longer working hours of women cause high cases of pulmonary Tuberculosis in men. In addition, consuming alcoholic beverages and smoking can make the body's defenses decrease, which has a significant influence on increasing the risk of Tuberculosis (Bawonte et al., 2021). With these factors, men are far more susceptible to tuberculosis bacteria than women and children, who are also left behind in large numbers. In addition to their vulnerable lifestyle, they are also people who are close to tuberculosis sufferers (Avy et al., 2024). This research is in line with research from (Haddase et al., 2024), which says that there is a gender relationship with the incidence of Tuberculosis in outpatients at Noongano.

Relationship of Knowledge with the Incidence of Tuberculosis in the Work Area of the Pasar Ikan Health Center

The study's results explained that of the 64 respondents, 17 respondents (26.6%) had good knowledge, 12 respondents (18.8%) had sufficient knowledge and 35 respondents had insufficient knowledge. Statistical test results obtained p> 0.009. because p <0.05 means a significant relationship exists between knowledge and the incidence of Tuberculosis in the working area of the Pasar Ikan Health Center.

Based on the study results (Avy et al., 2024), the respondents' knowledge was inadequate because the respondents did not know or understand what pulmonary Tuberculosis was. They know that pulmonary TB is a disease whose cause is food poisoning in the lungs, but they do not understand the bacteria that cause pulmonary TB disease, which causes Mycobacterium tuberculosis; the respondents do not understand the symptoms of pulmonary TB disease such as Respondents do not understand the impact of having this disease, besides that the respondents did not know how to prevent and treat pulmonary tuberculosis spital.

Someone with Tuberculosis needs to attend tuberculosis treatment seminars or counseling to increase knowledge about treatment. If treatment is interrupted, it will affect the success rate of treatment. Therefore, knowledge about tuberculosis treatment is important so that treatment is successful and the cure rate increases. (Pulungan & Permatasari, 2021)

The Relationship between Attitudes and Tuberculosis in the Work Area of the Pasar Ikan Health Center

The results showed that of the 64 respondents, 37 (57.8%) had a negative attitude, and 27 (42.2%) had a positive attitude. The statistical test results obtained $p>0.011$ because $p<0.05$ means a significant relationship exists between attitudes and the incidence of pulmonary TB in the work area of the Pasar ikan Health Center.

Attitude is a form of behavioral process that is responded to by objects received by someone. This attitude shows the readiness of the response to the object received by someone. This process begins with the information received by individuals. This acquired knowledge can be gleaned from sight or confirmed by the individual's existing knowledge. When information is received, individuals respond with attitude (Nasution & Elfira, 2023). In this study, the information received was the incidence of pulmonary Tuberculosis. The attitude factor greatly influences the health status of individuals and society; even pulmonary tuberculosis patients play an important role in preventing the spread of Tuberculosis (Sigalingging et al., 2019). The results of this study are consistent with (Zifodya et al., 2021), in which there is a significant relationship between attitudes and the incidence of pulmonary TB in the working area of the Muliorejo Health Center.

The relationship between smoking habits and the incidence of Tuberculosis in the working area of the Pasar Ikan Health Center

The results showed that out of 64 respondents, 33 (51.6%) had smoking habits, and 31 (48.4%) did not. The statistical test results obtained $p>0.003$ because $p<0.05$ means a significant relationship exists between smoking habits and the incidence of Tuberculosis in the working area of the Pasar ikan Health Center.

Research conducted (by Huang et al., 2025) explains that there is a significant relationship between smoking and the prevalence of Tuberculosis, namely due to smoking habits and exposure to tobacco smoke in passive and active smokers, where toxins in tobacco smoke can enter the lungs, thereby affecting immunity: body and increased tuberculosis infection.

The longer a person smokes, the greater the health effects (Pralambang & Setiawan, 2021). Based on a clinical point of view, it is known that smoking in the long term is at risk for the spread of Mycobacterium tuberculosis because exposure to cigarette smoke continuously can damage alveolar macrophages in the lungs, thereby damaging the immunity of T cells or lymphocytes, which have the function of differentiating various types of pathogens and making the body immune. Increases every time the body is exposed to

pathogens; besides that, smoking habits facilitate the appearance of pulmonary tuberculosis infection (Humayun et al., 2022).

The Relationship between Occupational Density and Tuberculosis in the Working Area of the Pasar Ikan Health Center

The study results showed that out of 64 respondents, 18 respondents (28.1%) had housing conditions that did not comply with the requirements, and 46 respondents (71.9%) had residential conditions that met the requirements. The statistical test results obtained p>0.012 because p<0.05 means a significant relationship exists between occupancy density and the incidence of Tuberculosis in the working area of the Pasar ikan Health Center.

According to Stevany, occupancy density is an indicator that triggers high rates of pulmonary TB transmission. This density will affect the occupants, and the house area that is not balanced with the number of occupants will create overcrowding. This becomes unhealthy because it results in less oxygen consumption, so if one family member has an infectious disease such as TB, it can easily infect other families (Stevany et al., 2021). This study's results align with the research (Togatorop, 2021). Statistical tests showed p <0.05, where p = 0.009 means a significant relationship between occupancy density and the incidence of pulmonary TB in the Medan Johor Health Center working area in 2020.

The relationship between ventilation and the incidence of Tuberculosis in the work area of the Pasar Ikan Health Center

The results showed that of the 64 respondents, 17 (26.6%) had ventilation that did not comply with the requirements, and 47 (73.4%) had ventilation that complied with the requirements. The results of the chi-square test obtained p <0.024. Because p <0.05 means there is a significant relationship between ventilation and the incidence of Tuberculosis in the working area of the Pasar Ikan Health Center.

Improper ventilation blocks sunlight and air from entering the house, allowing the tuberculosis germs to be breathed out along with the inhaled air (Latif et al., 2023).

House ventilation greatly influences air dilution. This means that it can dilute TB germs and other germs by exchanging air so that TB germs are carried out and killed by ultraviolet rays. The availability of good ventilation will reduce the transmission rate due to the inhalation of droplets from pulmonary TB patients (Abriansyah & Kardewi, 2022).

The Relationship between Humidity and the Incidence of Tuberculosis in the Work Area of the Pasar Ikan Health Center

The study results showed that out of 64 respondents, 23 (35.9%) had humidity conditions that were not suitable or did not meet the requirements, and 41 people (64.1%) had humidity conditions that met the requirements. The chi-square test results obtained p <0.009 because p <0.05 means a significant relationship exists between humidity and tuberculosis incidence in the working area of the Pasar Ikan Health Center.

Humidity is a factor strongly related to the incidence of pulmonary TB, where the humidity in the house is a suitable medium for bacteria that cause TB to grow so that it will make transmission occur quickly due to unhealthy environmental support. (Muslimah, 2019). Research conducted in 2016 by (Indriyani, N., Istiqomah, and Anwar, 2016) states a significant relationship between air humidity and the incidence of pulmonary Tuberculosis.

The Relationship between Lighting and the Incidence of Tuberculosis in the Work Area of the Pasar Ikan Health Center

The results of this study indicate that out of 64 respondents, 28 (62.5%) had lighting conditions that did not meet the requirements, and 36 people (56.3%) had lighting conditions that met the requirements. The results of the chi-square test obtained p> 0.006 because p <0.05 means that there is a significant relationship between lighting and the incidence of Tuberculosis in the work area of the Pasar Ikan Health Center.

Direct exposure to ultraviolet light will kill bacteria within minutes (Kuswardani et al., 2023). Insufficient lighting will be a good breeding ground for bacterial growth. Lighting can be connected with windows because they can serve as a way for light to enter, especially sunlight, especially when sunlight enters. Therefore, a window is needed that meets the requirements so that the light in the room meets the requirements (Rizki, 2024). Inadequate lighting increases the incidence of pulmonary TB because lighting conditions are a significant risk factor, and sunlight is a factor that can kill pulmonary TB germs. Therefore, good lighting can prevent the growth and transmission of bacteria (Ningrum et al., 2022).

CONCLUSION

According to the results of research on the factors that influence the incidence of TB conducted at the Pasar Ikan Health Center, which examined 64 respondents consisting of 32 case groups (TB) 32, it can be concluded that there is a significant relationship between age, gender, knowledge, attitude, smoking habits, occupancy density, ventilation, humidity, and lighting of the incidence of TB at the Pasar Ikan Health Center.

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