

The Determinant of Positive Pulmonary Tuberculosis in the Working Area of Tanah Tinggi Public Health Center, Binjai Timur Subdistrict, 2018

Dian Maya Sari Siregar^{1*}

¹*Public Health Faculty, Institut Kesehatan Helvetia, Medan, Indonesia*
**Corresponding author. Email: dianmayasari.srg@gmail.com*

ABSTRACT

Tuberculosis is a cause of death in developing countries in the world and Indonesia is one of the countries with the most TB sufferers. One of the districts in North Sumatra that has the highest positive pulmonary tuberculosis cases is Binjai and Binjai Timur is one of the sub districts in this city. The study aims to determine the determinant of positive pulmonary tuberculosis in the working area of Tanah Tinggi Public Health Center in 2018. The type of research is observational analytic with Case Control design. The number of samples is 35 cases and 35 controls. Sampling with non-probability sampling method is based on secondary data sequence from medical records that required the criteria. Data analysis was performed univariate, bivariate with Chi-Square Test, and multivariate with Logistic Regression Test. The bivariate analysis showed the p value of each variable, namely: occupancy density with p value= 0.004; ventilation with p value= 0.001; type of floor with p value= 0.356; knowledge with p value= 0.015; attitude with p value= 0.039; and actions with p value= 0,000. The multivariate analysis showed that the most dominant variable affecting the incidence of positive pulmonary TB was action with OR= 43.375 (95% CI = 4.967 - 378,777). It is recommended for health workers at Tanah Tinggi Public Health Center to increase their knowledge, experience, and public health actions so that the community avoids various environmental-based diseases such as pulmonary TB.

Keywords: *determinant, positive pulmonary tuberculosis*

1. INTRODUCTION

Tuberculosis is an infectious disease transmitted by the bacterium *Mycobacterium tuberculosis*, a cause of death especially in developing countries around the world. This disease is spread throughout the world, and Indonesia is known as the largest country with tuberculosis sufferers throughout the world after India and China. This disease attacks the Pulmonarys [1]. *M. tuberculosis* bacteria not only attack the Pulmonarys but also other organs such as bones, brain, etc. These bacteria have a characteristic that is acid resistant. Therefore, this bacterium is also called acid-resistant bacilli (BTA). At present, tuberculosis is still a public health problem in Indonesia because of the high morbidity and mortality rate caused by the tuberculosis [2].

Tuberculosis is a disease of global concern, but tuberculosis is estimated to still attack 9.6 million people and cause 1.2 million deaths in 2014. Countries with the most tuberculosis sufferers are India 23%, Indonesia 10% and China 10% of all sufferers in world [3]. Indonesia is a tropical country that has a high level of humidity. This is in accordance with the characteristics of *M. tuberculosis* bacteria that like to live in humid places. Based on the

report of the World Health Organization (WHO) in 2014, there were 9.6 million people worldwide suffering from pulmonary tuberculosis and 1.5 million of them died. WHO also mentioned that the incidence rate of pulmonary tuberculosis in 2014 was 183 / 100,000 population and the prevalence rate of tuberculosis in 2014 was 272 / 100,000 population [2]. Pulmonary Tuberculosis in Indonesia is still one of the endemic diseases because according to the 2015 Household Health Survey (SKRT) that in Indonesia Pulmonary Tuberculosis is the number 2 (two) death disease after cardiovascular disease in all age groups and the first rank of causes death for this type of infectious disease. It is estimated that each year there are 500,000 pulmonary tuberculosis T-shirts where 300,000 patients can be around the puskesmas, 200,000 are found in government hospitals / clinics. The number of deaths due to pulmonary tuberculosis is estimated at 175,000 people per year [4].

According to the Indonesian Health Profile (2015), Tuberculosis can affect all ages, not only old age, but also young age and productive age. According to the age group, the most recent cases were found in the age group 25-34 years, (18.65%), followed by the 45-45 year age group (17.33%), and the 35-44 year age group (17.18%). By sex,

the number of smear positive cases in males is 1.5 times higher compared to positive smear cases in females [5]. According to the North Sumatra Province Health Service (2014), of all the provinces in Indonesia which have Tuberculosis sufferers, North Sumatra Province is in the sixth position with the highest number of sufferers. Tuberculosis patients in North Sumatra Province in 2014 were recorded as many as 16,500 people. The first position was North Sulawesi with 23,800 people, West Papua with 23,500 people, DKI Jakarta with 22,200 people, Papua with 21,600 people, Maluku with 21,300 people. In 2014, the number of positive pulmonary TB sufferers in Binjai City was 232 people [6].

The results of research on the role of Tobing in transmission of Tuberculosis are environmental. Poor environment is very supportive of the active and well-developed *M. tuberculosis* bacteria. The environment especially the home environment is very risky for the breeding and spread of bacteria because these bacteria are in the air. The presence of bacteria in the air is largely determined by the humidity in the house, incoming sunlight and ventilation. This bacterium can last a long time in the air if in a humid room and not exposed to the sun. The condition of the house with minimal sunlight or light causes the Pulmonary Tuberculosis bacteria to survive so that it has a great chance to cause pulmonary TB cases [7].

Individual behavior is also a risk factor for transmission of pulmonary tuberculosis. There are some behaviors that are very risky in transmission, namely not opening a house window, using the same eating utensils as a sufferer, and indiscriminate spitting habits. Community habits such as not closing the mouth when coughing and spitting at random places, closing the window of the house during the day are also related to the transmission of Tuberculosis [7].

Based on the Health Profile of the City of Binjai in 2014, of 13,257 houses in the Binjai Timur Subdistrict, only 2,460 houses or around 18.56% were qualified as healthy houses while the remaining 10,797 or around 81.44% of the houses were included in the category of houses that did not meet prerequisites for a healthy home [8]. According to a preliminary survey conducted by researchers at the end of 2017 at the Tanah Tinggi Health Center in Binjai Timur Subdistrict by looking at secondary data, namely the medical records of patients in 2017, it can be seen that the number of positive Pulmonary Tuberculosis cases in January was 68 cases, February was 59 cases, March was 53 cases, April 45 cases and May 56 cases. In addition, it is known that in the work area of Tanah Tinggi Puskesmas Tanah Binjai Timur there are still many percentage of unhealthy houses in the Tanah Tinggi Puskesmas, namely: Sending 25.4%, Tunggurono 15%, Plateau 76.5%, Timbang Langkat 46, 9%, Tanah Tinggi 26.0%, Sumber Mulyorejo 3.7%, Sumber Karya 31.3% [9]. From the above description, the writer is interested in conducting research with the title "The Determinants of Positive Pulmonary Tuberculosis (TB) in the Working Area of

Tanah Tinggi Health Center Binjai Timur Subdistrict in 2018".

2. METHOD

This study uses an observational analytic method with a case control design. The population in this study were all residents in the work area of the Tanah Tinggi Health Center in Binjai Timur District. The sample in this study was taken by using the non-probability sampling method, which is the case group and control group sampling based on secondary data sequences (case study and control populations) from medical records that meet the inclusion and exclusion criteria. Case and control sampling is done simultaneously based on secondary data that meets the inclusion and exclusion criteria. The process of sampling according to the number of samples needed is based on the latest data sequence until the longest data so that it reaches the target number of samples. If the number of samples has not been sufficient, the secondary data period interval used is widened.

Determination of the number of samples for a case control study by considering the Odds Ratio results from previous studies. Based on the Lameshow formula obtained a sample of 35 people. Thus, each case and control group was taken as many as 35 people with the following criteria:

Case: Inclusion criteria, namely 1) From the results of the examination found positive smear on sputum examination, at least two of the three SPS BTA specimens were positive and added chest X-ray photos, 2) Residing in the working area of Tanah Tinggi health center, and 3) Patients aged > 15 years. Exclusion Criteria if the respondent dies or cannot be found.

Control: Inclusion criteria, namely 1) Having the same symptoms, namely weak body, decreased appetite, body temperature down, feeling unwell and coughing, but the results of the examination were phlegm negative, 2) Residing in the working area of Tanah Tinggi Puskesmas, and 3) Patients who are > 15 years old. Exclusion Criteria if in a state of illness or cannot be found.

Matching of cases and controls was done based on the age and sex of the respondent.

Univariate analysis is the analysis used to describe the frequency distribution of each variable, the independent variable, the dependent variable and the description of the respondent's characteristics. Bivariate analysis is an analysis conducted to find out the relationship between independent and dependent variables using the Chi-Square test at a 95% confidence level ($p < 0.05$). Multivariate analysis is an advanced analysis that allows to find out the most dominant independent variable influencing the dependent variable. The data analysis of this research was carried out by a logistic regression test at the 95% significance level ($\alpha = 0.05$).

3. RESULTS AND DISCUSSION

The results of the study can be found in the table below:

Table 1. Cross Tabulation of Each Research Variable with Positive Pulmonary TB in the Working Area of Tanah Tinggi Health Center Binjai Timur in 2018

Variable	Pulmonary TB				p Value	OR (95% CI)
	Cases		Control			
	f	%	f	%		
Occupancy Density						
Not eligible	16	45.7	5	14.3	0.004	5.053 (1.589-16.069)
Qualify	19	54.3	30	85.7		
Ventilation						
Not eligible	25	71.4	11	31.4	0.001	5.455 (1.960-15.176)
Qualify	10	28.6	24	68.6		
Floor Type						
Not eligible	4	11.4	1	2.9	0.356	4.387 (0.465-41.404)
Qualify	31	88.6	34	97.1		
Knowledge						
Less	19	54.3	9	25.7	0.015	3.431 (1.251-9.404)
Well	16	45.7	26	74.3		
Attitude						
Negative	15	42.9	7	20.0	0.039	3.000 (1.034-8.702)
Positive	20	57.1	28	80.0		
Action						
Less	27	77.1	7	20.0	0.000	13.500 (4.301-42.375)
Well	8	22.9	28	80.0		
Total	35	100.0	35	100.0		

Table 2. Final Results of the Double Logistic Regression Test Determinants of Positive Pulmonary TB in the Working Area of Tanah Tinggi Health Center Binjaia Timur in 2018

	Variabel Independen	Nilai B	Nilai p	Exp (B)	95% C.I. for Exp (B)	
					Lower	Upper
					Step 1 ^a	Occupancy Density
	Ventilation	0.504	0.481	1.656	0.407	6.739
	Knowledge	-0.809	0.599	0.445	0.022	9.073
	Attitude	-1.186	0.446	0.305	0.012	6.456
	Action	3.521	0.004	33.808	3.060	373.523
	Constant	-1.497	0.002	0.224		
Step 2 ^a	Occupancy Density	1.014	0.148	2.757	0.698	10.885
	Ventilation	0.509	0.476	1.664	0.411	6.737
	Attitude	-1.781	0.127	0.168	0.017	1.660
	Action	3.361	0.003	28.827	3.031	274.141
	Constant	-1.526	0.001	0.217		
Step 3 ^a	Occupancy Density	1.038	0.134	2.825	0.726	10.997
	Attitude	-1.693	0.140	0.184	0.019	1.747
	Action	3.568	0.001	35.439	3.966	316.703
	Constant	-1.405	0.001	0.245		
Step 4 ^a	Attitude	-1.641	0.147	0.194	0.021	1.784
	Action	3.770	0.001	43.375	4.967	378.777
	Constant	-1.225	0.002	0.294		

The Relationship Between Occupancy Density and Positive Pulmonary TB in the Working Area of Tanah Tinggi Health Center in 2018

Chi-Square Test Results showed the value of $p = 0.004 < \alpha = 0.05$. Means there is a relationship between the density of occupancy and of positive pulmonary TB in the working area of the Tanah Tinggi Health Center in 2018. The results of this study are in line with studies conducted by Lanus, Suyasa, and Sujaya (2012) which state that there is a relationship between occupancy density and pulmonary TB in Bangli District ($p = 0.015$) [10]. Another study conducted by Heriyani, Sutomo, and Saleh (2012) stated that there was a significant relationship between occupancy density and the incidence of pulmonary TB in Banjarmasin City ($p = 0.019$) [11]. Research conducted by Bati, Ratag, and Umboh (2013) also states that there is a significant relationship between occupancy density and the incidence of pulmonary TB in the Wara North Health Center Working Area in Palopo City ($p = 0,000$) [12]. In addition, a study conducted by Deny, Salam, and Novianry (2014) also stated that there was a relationship between occupancy density and the incidence of pulmonary TB in the working area of Perumnas I and II Health Center in West Pontianak District ($p = 0,000$) [13].

Occupancy density is the ratio between the floor area of a house and the number of family members in a single house. The occupancy density requirements for all ordinary housing are stated in m² per person. The minimum area per person is very relative, depending on the quality of the building and the facilities available. For simple housing, a minimum of 8 m² / person. For bedrooms, a minimum of 2 persons is required. The bedroom should not be occupied by > 2 people, except for husband and wife and children under two years. If there are family members who are sufferers of pulmonary TB should not sleep with other family members. The density of housing in one house will have an effect on the occupants. The area of the house that is not proportional to the number of residents will be overcrowded (full / crowded). This is unhealthy because besides causing a lack of oxygen consumption, also if one family member suffers from an infectious disease especially Pulmonary TB will be easily transmitted to other family members, this is because Lung TB germs can be transmitted through air media, an average sufferer can transmit to two to three people in his home [14].

Density of house occupancy according to Decree of the Minister of Health No. 829 / MENKES / SK / VII / 1999 concerning house health requirements, 1 person occupies a minimum area of 8 m². With these criteria it is expected to prevent disease transmission and launch activities. Dense living conditions can bind pollution factors in existing homes [15].

The Relationship Between Ventilation and Pulmonary Tuberculosis in the Working Area of Tanah Tinggi Health Center in 2018

Chi-Square Test Results showed $p \text{ value} = 0.001 < \alpha = 0.05$. Means there is a relationship between ventilation and

the incidence of positive pulmonary TB in the working area of Tanah Tinggi Health Center in 2018.

The results of this study are in line with research conducted by Ruswanto (2010) which states there is a relationship between ventilation and the incidence of pulmonary TB in Pekalongan District ($p = 0.014$) [16]. Another study conducted by Ayomi, Setiani, and Joko (2012) also stated there was a relationship between ventilation and the incidence of pulmonary TB in the Sentani Health Center working area of Jayapura Regency ($p = 0.020$) [17]. Subsequent research was conducted by Kurniasih, Triyantoro, and Widyanto (2016) which showed a relationship between ventilation and the incidence of pulmonary TB in the Kalibogor Health Center working area of Banyumas Regency ($p = 0.018$) [18]. However, the results of this study are not in line with research conducted by Syafri (2015) which states that there is no relationship between ventilation and the incidence of pulmonary TB in the Ngemplak Boyolali Community Health Center ($p = 0.230$) [19].

In general, the assessment of house ventilation by comparing the area of ventilation and floor area of the house, using the Role Meter. According to home supervision indicators, the area of ventilation that meets health requirements is $\geq 10\%$ of the floor area of the house and the area of ventilation that does not meet the requirements is $\leq 10\%$ of the floor area of the house [14]. Houses with ventilation that do not meet health requirements will have an impact on residents. One function of ventilation is to keep the air flow in the house fresh. Area ventilation that is $< 10\%$ of the floor area (does not meet the requirements) will result in reduced oxygen consumption and an increase in the concentration of carbon dioxide which is toxic to its inhabitants. In addition, inadequate ventilation will cause an increase in room humidity due to the process of evaporation of fluids from the skin and absorption. High room humidity will be a good medium to grow and multiply pathogenic bacteria including germs [20].

In addition, the second function of ventilation is to free the room air from bacteria, especially pathogenic bacteria. Bacteria carried by the air will always flow. In addition, extensive ventilation that does not meet health requirements will result in obstruction of the process of exchange of air flow and sunlight that enters the house, as a result of germs that are in the house cannot come out and come inhaled with breathing air [14].

The Relationship Between Floor Type and Pulmonary TB in the Working Area of Tanah Tinggi Health Center in 2018

Fisher's Exat Test Results showed $p \text{ value} = 0.356 > \alpha = 0.05$. Means there is no relationship between the type of floor with the incidence of positive pulmonary TB in the work area of Tanah Tinggi Puskesmas in 2018.

The results of this study are in line with the research of Bachtiar, Ibrahim, and Ruslan (2012) which states that there is no relationship between the type of floor with the incidence of pulmonary TB in Bima City, NTB Province ($p = 0.24$) [21].

Although the results of the study show that there is no relationship between the type of floor and pulmonary TB, the community needs to pay attention to the condition of the house floor because in another study conducted by Rosiana (2014) states that there is a relationship between the type of floor with pulmonary TB in the working area of the Kudungmundu Community Health Center. City of Semarang ($p = 0.025$ and $OR = 4,792$) [22]. This means that patients with pulmonary TB have a type of floor that does not meet the requirements of 4.792 times greater than those who do not suffer from pulmonary TB.

House flooring is very important to consider especially in terms of cleanliness and requirements. The floor from the ground is better not to be used anymore because if the rainy season will become humid so that it can cause interference with the inhabitants and is a good place for breeding germs, including bacteria that cause pulmonary TB. We recommend that the floor of the house is made of waterproof materials and easy to clean. To prevent water from entering the house, the floor should be raised about 25 cm from the ground. A good floor is a floor that is dry and not moist. The floor material must be waterproof, easy to clean and not produce dust [14].

The Relationship Between Knowledge and Pulmonary Tuberculosis in the Working Area of Tanah Tinggi Health Center in 2018

Chi-Square Test Results showed the value of $p = 0.015 < \alpha = 0.05$. Means there is a relationship between knowledge and positive pulmonary TB in the working area of Tanah Tinggi Health Center in 2018.

The results of this study are in line with Hamidi's (2011) research which states that there is a relationship between maternal knowledge and the incidence of children's pulmonary TB in Salatiga City ($p = 0.012$) [23]. However, the results of this study are not in line with research conducted by Kurniasari, Suhartono, and Cahyo (2012) which states that there is no relationship between knowledge and the incidence of pulmonary TB in Baturetno District Wonogiri Regency ($p = 0.085$) [24]. Another study conducted by Bachtiar, Ibrahim, and Ruslan (2012) also showed no relationship between knowledge and t pulmonary TB in Bima City, NTB Province ($p = 0,000$) [21].

Knowledge is the result of knowing, and this happens after people have sensed humans, namely the sense of sight, hearing, smell, taste, and touch. Knowledge basically consists of a number of facts and theories that enable a person to solve the problems he faces. Such knowledge is obtained from both direct experience and the experience of others [25].

Knowledge is the result of knowing, and this happens after people have sensed certain objects. Sensing occurs through the five human senses, namely the sense of sight, hearing, smell, taste and touch. Most of human knowledge is obtained through the eyes and ears. If someone accepts new behavior or adopts behavior based on knowledge, awareness and positive attitude, then the behavior will last a long time. Conversely, if the behavior is not based on knowledge and awareness it will not last long [26].

The Relationship between Attitudes and Pulmonary TB in the Working Area of Tanah Tinggi Health Center in 2018

Chi-Square Test Results showed the value of $p = 0.039 < \alpha = 0.05$. Means there is a relationship between attitude and positive pulmonary TB in the working area of the Tanah Tinggi Health Center in 2018. The results of this study are in line with Hamidi's (2011) study which states that there is a relationship between maternal attitudes and the incidence of pulmonary TB in children in Salatiga City ($p = 0.015$) [23]. However, the results of this study are not in line with research conducted by Kurniasari, Suhartono, and Cahyo (2012) which states that there is no relationship between attitude and the incidence of pulmonary TB ($p = 0.052$) in Baturetno District Wonogiri District 2012 [24]. Another study conducted by Bachtiar, Ibrahim, and Ruslan (2012) also showed no relationship between attitude and the incidence of pulmonary TB in Bima City, NTB Province ($p = 0.16$) [21].

Attitude is a form of evaluation or reaction of feeling; attitude is seen as feeling either side or against a psychological object. A person's attitude towards an object is a feeling of supporting or taking sides as well as a feeling of not supporting or not taking sides with a particular object. In determining complete attitudes, knowledge, thoughts, beliefs and emotions play an important role. Like knowledge, attitude also has a level based on its intensity, which is willing to accept a given stimulus (object), find answers or responses to questions or ojegers faced, give a positive value to the object or stimulus, in the sense of language with others, even invites or influence or encourage others to respond, the highest level of attitude is to be responsible for what they believe [25].

Attitude has an important role in explaining someone's behavior in their environment, although there are still many other factors that influence behavior such as stimulus, individual background, motivation and personality status. In return, environmental factors also influence attitudes and behavior [26].

The Relationship between Actions and Tuberculosis in the Working Area of Tanah Tinggi Health Center in 2018: Chi-Square Test Results showed the value of $p = 0,000 < \alpha = 0.05$. Means there is a relationship between actions with positive pulmonary TB in the working area of the Tanah Tinggi Health Center in 2018.

This study is in line with the results of Hamidi's (2011) study which states that there is a relationship between maternal actions and the incidence of pulmonary TB in children in Salatiga City ($p = 0.044$) [23]. Other research conducted by Bachtiar, Ibrahim, and Ruslan (2012) also showed no relationship between actions with the incidence of pulmonary TB in Bima City, NTB Province ($p = 0.042$) [21]. Other research that is also in line was carried out by Agustin and Sustini (2015) which stated there was a relationship between the action and Pulmonary TB in the Jagir Health center Working Area in Wonokromo District, Surabaya City ($p = 0,000$) [27].

An action will be carried out correctly or accordingly if there is an awareness, an interest in a stimulus, has been

understood based on the knowledge gained, has been tested or seen the results of the actions of someone who has run it [27].

According to M. Hariwijaya and Sutanto in Hamidi (2011), transmission and spread of pulmonary tuberculosis are strongly associated with behavioral and environmental factors. Environmental and sanitary factors are closely related to the presence of the causative bacteria and the processes arising and their transmission. Behavioral factors are very influential on healing and prevention in order to avoid tuberculosis infection [23].

Blum's theory in Hamidi (2011) also states that behavioral factors are the second largest component in determining health status. Transmission of pulmonary TB disease can be caused by behaviors that do not meet health, such as the habit of opening a window or the habit of removing phlegm from a patient who is not right. Lack of air flow in the home increases CO₂ levels and increases air humidity which is a good medium for pathogenic bacteria. These reasons cause transmission of pulmonary TB disease in the family [23].

4. CONCLUSION

Based on the research that has been carried out it can be concluded as follows: 1) Variable occupancy density, ventilation, knowledge, attitudes and actions are determinants of Positive Pulmonary TB in the working area of Tanah Tinggi Health Center in 2018, 2) Variables in floor type are not a determinant of Positive Pulmonary TB events in the working area of Tanah Tinggi Puskesmas in 2018, and 3) The action variable is the most dominant variable affecting Positive Pulmonary TB in the working area of Tanah Tinggi Health Center in 2018.

Suggestions that the authors can convey from the results of this study are as follows: 1) For further researchers, further research needs to be done to enrich public health scientific studies on the prevention and transmission of pulmonary TB, such as the assessment of humidity, lighting and temperature indicators that are very closely related to tuberculosis because the assessment of the indicators was not carried out in this study, 2) For the Binjai City Health Office, it is necessary to carry out environmental-based community health efforts, especially housing rehabilitation to prevent the transmission of pulmonary TB in Binjai City, 3) To the Health Officers of Tanah Tinggi, need to do health education about pulmonary TB and transmission to the community to increase knowledge, experience, and behavior of public health so that people avoid various environmental-based diseases such as pulmonary TB and other diseases, and 4) To the people who already have high behavioral Good health needs to be maintained and to people who still have bad behavior need to be improved again.

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