

Analysis of the Relationship between the Physical Conditions of the House, Smoking and the Incidence of Pulmonary Tuberculosis in Central Buton

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ABSTRACT

This study aims to determine the relationship between the physical condition of the house and smoking habits with the incidence of pulmonary tuberculosis. The type of research used is a cross sectional study. The sample amounted to 100 people. Data collection was obtained through primary data and secondary data. The analysis used was univariate analysis and bivariate analysis at the 95% confidence level ($\alpha = 0,05$). The results showed that the relationship between the walls of the house ventilation house occupancy smoking habit with the incidence of pulmonary tuberculosis. The conclusion shows that there is a relationship between the physical condition of the house (walls, ventilation, housing) and smoking habits with the incidence of pulmonary tuberculosis

INTRODUCTION

Poor environmental sanitation conditions can be a medium for disease transmission. The occurrence of environmental-based diseases is due to the interaction between humans and the environment. If the sanitation of the home environment is not considered, it has the potential to cause a disease such as pulmonary tuberculosis (pulmonary TB) (Aprinda, 2017).

Based on data obtained from the World Health Organization (WHO) states that tuberculosis remains the 10 highest cause of death in the world and deaths from tuberculosis globally are estimated at 1.3 million patients. Globally, new cases of tuberculosis amounted to 6.4 million, equivalent to 64% of the incidence of tuberculosis (10.0 million). This of course causes the world's tuberculosis (TB) situation to worsen, where the number of TB cases increases and many are unable to be cured (RI Ministry of Health, 2020).

Some countries that have the largest tuberculosis burden are India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (5%), Nigeria (4%), Bangladesh (4%) and South Africa (3%). The incidence rate of tuberculosis in Indonesia in 2018 was 319 per 100,000 population and the death rate for tuberculosis sufferers was 40 per 100,000 population. The number of tuberculosis cases in 2019 was found to be 566,623 cases, an increase compared to all tuberculosis cases found in the previous year, namely 446,732 cases. The highest number of cases reported were in provinces with large populations, namely 44% of the total number of tuberculosis cases in Indonesia. The target prevalence of tuberculosis in 2019 is 254 per 100,000 population with an achievement of 250 per 100,000 population (RI Ministry of Health, 2020).

The proportion of new pulmonary TB patients from all TB cases in Southeast Sulawesi from year to year is quite good. In 2017 the proportion of Southeast Sulawesi has reached 89%, in 2018 it has reached 79.55%, and in 2019 the average achievement of districts/cities has decreased to 72.06%. However, when viewed per district/city, there are still 4 districts/cities whose achievements are below the national target, namely South Buton, North Kolaka, South Konawe and Wakatobi (Southeast Sulawesi Health Office, 2020).

Based on the profile of the Buton Tengah District Health Office, the prevalence of pulmonary TB disease from 2016 was found 94 cases, increased in 2017 to 121 cases, in 2018 found 103 cases of positive smear pulmonary TB, and in 2019 found 162 cases of positive smear pulmonary TB. Based on data on the prevalence of pulmonary TB cases in Central Buton District, pulmonary TB is still a public health problem in Central Buton District. This is because the cases are quite high and this disease can cause negative social impacts because this disease is highly contagious (Buton Tengah Health Office, 2020).

Central Mawasangka Health Center is one of the health centers in the working area of the Central Buton District Health Office. Based on the 2016 report, the number of pulmonary TB patients found and recorded was 31 patients with positive smears, in 2017 there were 77 patients with smear positive smears, in 2018 there were 240 suspected pulmonary TB with positive smears of 20 patients, in 2019 there were 196 suspects. Pulmonary TB, in 2020 there were 100 suspected pulmonary TB, and from January to April 2021 there were 94

suspected pulmonary TB. Based on these data, it shows that the incidence of pulmonary TB still occurs frequently every year. As an effort to tackle pulmonary TB, the degree of human health related to pulmonary TB disease can be influenced by environmental factors such as kitchen smoke, behavioral factors such as family smoking habits in the house, and health service factors. The determinants of the cause of increased pulmonary TB disease are population including gender, age, nutritional status, socioeconomic conditions. While environmental factors include density, house floors, and ventilation (Moha, 2014).

The low level of healthy home ownership, such as the physical environment of the house and smoking habits, is one of the causes of pulmonary TB every year. Therefore, the purpose of this study was to determine the relationship between house walls, ventilation, house occupancy and smoking habits with the incidence of pulmonary tuberculosis in the working area of the Mawasangka Tengah Health Center, Central Buton Regency.

THEORETICAL FRAMEWORK

The degree of human health related to pulmonary TB disease can be influenced by environmental factors such as kitchen smoke, behavioral factors such as family smoking habits in the house, and health service factors. The determinants of the cause of increased pulmonary TB disease are population including gender, age, nutritional status, socioeconomic conditions. While environmental factors include density, house floors, and ventilation (Moha, 2014).

The results of the research that has been done show that the quality of the physical condition of the house and health behavior associated with the incidence of pulmonary TB are ventilation area, occupancy density, lighting intensity, and smoking habits. While the factor that most influences the incidence of pulmonary TB is lighting intensity (Anggraeni, 2015).

The variables taken from these factors are the most related or significant variables carried out by several previous researchers, namely the physical condition of the house in the form of residential density, walls, house ventilation, and then smoking habits are related to air pollution in the house. Therefore, researchers took several independent variables based on the results of previous studies which showed that there was a relationship between each variable and the incidence of pulmonary tuberculosis.

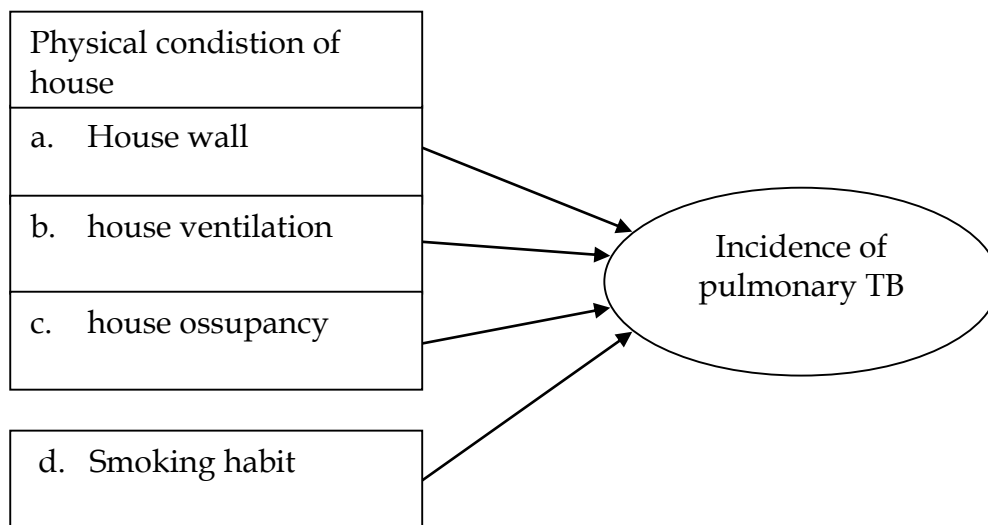


Figure 1. Conceptual Framework

METHODOLOGY

The research was conducted using quantitative methods with a cross sectional study approach. This research was carried out from May 7 to June 7 2021 in the Work Area of the Central Mawasangka Health Center, Central Buton Regency. The variables examined in this study were the walls of the house, house ventilation, house occupancy and smoking habits with the incidence of pulmonary tuberculosis. The population in this study were all suspected pulmonary TB patients at the Mawasangka Tengah Health Center, Central Buton Regency from January to April 2021, namely 94 people. The number of samples in this study were 94 people with the sampling method used was total sampling. The collection of research data consisted of primary data obtained using a questionnaire and secondary data obtained from the puskesmas' report records. Data processing was carried out computerized using the SPSS version 20 program. Data analysis used was in the form of univariate analysis, namely to find out the frequency distribution of each variable studied and bivariate analysis, which was to find out the relationship of each variable under study using the chi square test, which is a method for determining the relationship between a variable to other variables with a value of $\alpha = 0.05$ at the 95% level of confidence.

RESULTS

Table 1 shows that the identity of the subjects is in the age group, most of the subjects are in the age group 34-39 years, namely 37 people (39.4%) and the least number of subjects are in the age group 46-49 years, namely 11 people (11.7%). Based on gender, most of the subjects were male, namely 60 people (63.8%) and female subjects, only 34 people (36.2%). Based on the last education, the most recent education of the subjects was high school graduation, namely 45 people (47.9%) and the least recent education of the subjects was elementary school graduates, namely 2 people (2.1%).

Table 1. Subject Identity (n=94)

Subject identity	n	%
Age group (year)		
27-33	20	21,3
34-39	37	39,4
40-45	26	27,6
46-49	11	11,7
Gender		
Male	60	63,8
Female	34	36,2
Last education		
Finished elementary school	2	2,1
Finished junior high school	36	38,3
Finished graduate high school	45	47,9
Graduate Diploma	6	6,4
Graduate	5	5,3

Source: Primary data 2021

Table 2 shows that for the variable wall of the house, most of the subjects had walls that met the requirements, namely 71 people (75.5%) and subjects who had walls that did not meet the requirements, as many as 23 people (24.5%). As a variable of house ventilation, most subjects had house ventilation that met the requirements, namely 68 people (72.3%) and subjects who had house ventilation that did not meet the requirements, 26 people (27.7%). As for the occupancy variable, most of the subjects had housing that met the requirements, namely 62 people (66.0%) and subjects who owned houses that did not meet the requirements, as many as 32 people (34.0%). As a variable of smoking habits, the most subjects had smoking habits, namely 50 people (53.2%) and subjects who did not have smoking habits, 44 people (46.8%). Variable incidence of pulmonary TB, most people did not experience pulmonary TB, namely 71 people (75.5%) and had pulmonary TB as many as 23 people (24.5%).

Table 2. Variables studied (n=94)

Research variabel	n	%
House Wall		
Qualify	71	75,5
Not eligible	23	24,5
House Ventilation		
Qualify	68	72,3
Not eligible	26	27,7
House occupancy		
Qualify	62	66,0
Not eligible	32	34,0
Smoking Habit		
Yes	50	53,2

No	44	46,8
Incidence of Pulmonary TB		
Have pulmonary TB	23	24,5
Did not Have pulmonary TB	71	75,5

Source: Primary data 2021

The results of the chi square test analysis showed that the wall of the house variable showed $p(0.001) < \alpha(0.05)$, meaning that there was a relationship between the walls of the house and the incidence of pulmonary tuberculosis. The house ventilation variable shows $p(0.001) < \alpha(0.05)$, meaning that there is a relationship between house ventilation and the incidence of pulmonary TB. The house occupancy variable shows $p(0.000) < \alpha(0.05)$, meaning that there is a relationship between house occupancy and the incidence of pulmonary TB. The smoking habit variable shows $p(0.003) < \alpha(0.05)$, meaning that there is a relationship between smoking habits and the incidence of pulmonary TB.

Table 3. The Relationship between the Physical Condition of the House and Smoking Habits with the Incidence of Pulmonary Tuberculosis in the Working Area of the Mawasangka Tengah Health Center, Central Buton Regency

Variabel	Incidence of Pulmonary TB				Total	
	Have pulmonary TB		Did not Have pulmonary TB			
	n	%	n	%	n	%
House Wall						
Qualify	11	15,5	60	84,5	71	100
Not eligible	12	52,2	11	47,8	23	100
Chi Square Test, score $\rho = 0,001$						
House Ventilation						
Qualify	10	14,7	58	85,3	68	100
Not eligible	13	50,0	13	50,0	26	100
Chi Square Test, score $\rho = 0,001$						
House occupancy						
Qualify	6	9,7	56	90,3	62	100
Not eligible	17	53,1	15	46,9	32	100
Chi Square Test, score $\rho = 0,000$						
Smoking Habit						
Yes	19	38,0	31	62,0	50	100
No	4	9,1	40	90,9	44	100
Chi Square Test, score $\rho = 0,003$						

DISCUSSION

The Relationship between the Condition of the Walls of the House and the Incidence of Pulmonary Tuberculosis

The results showed that of the 71 subjects who had house walls that met the requirements, 11 (15.5%) had pulmonary TB, this was due to the condition of the subject's house walls which were made of bricks and plaster but rarely cleaned which could cause a lot of dust. which can irritate the respiratory tract. In addition, the presence of air vents on the walls of the subject's house which are always closed using curtains or zinc causes poor air circulation in the house and this condition can cause the occupants of the house to experience respiratory problems (coughing, runny nose, shortness of breath) and are not treated immediately so they experience TB. Lungs.

There were 60 (84.5%) subjects who had walls of a house that met the requirements and did not experience pulmonary TB. This is because most of the walls of the subject's house have fulfilled the requirements, namely having the condition that the walls are made of plastered bricks. The condition of the wall of the subject's house that meets these requirements can prevent the risk of transmission of pulmonary TB to the occupants of the house.

The results of the study also showed that there were 23 subjects who had walls that did not meet the requirements, consisting of 12 (52.2%) had pulmonary TB. This can happen because a house that has walls not made of plastered bricks can cause a lot of dust during the dry season and during the rainy season the walls of the house become damp and wet because a lot of water is absorbed into the walls. The condition of the walls of the house that is dusty and damp will become a breeding ground for *Mycobacterium tuberculosis* and result in transmission of pulmonary TB to the occupants of the house.

In addition, there were also 11 (47.8%) who did not experience pulmonary TB even though they had house walls that did not meet the requirements, this could be because none of the occupants of the house had pulmonary TB and there were healthy behaviors carried out by the residents of the house such as maintaining house cleanliness, opening windows in the morning and letting sunlight into the house with the aim of killing *Mycobacterium tuberculosis* so that they cannot reproduce because tuberculosis germs cannot survive in a clean environment and are exposed to direct sunlight.

The house wall variable statistically has a significant relationship with the incidence of pulmonary tuberculosis ($p < \alpha$). This can happen because the walls of the house that meet the requirements can function to support or support the roof, keep out wind and rainwater, protect from heat and dust from outside which affect humidity and are links in the transmission chain of pulmonary tuberculosis. The walls of a house that do not meet the requirements are a risk factor for the transmission of pulmonary TB and can be used as an indicator that there is a lack of understanding about healthy homes.

Based on the Decree of the Minister of Health of the Republic of Indonesia Number 1077/MENKES/PER/V/2011, houses that have walls made of bamboo, plywood and wood tend to cause dampness, and can cause dust which is harmful to the occupants of the house. A healthy house has walls made

of bricks and plastered with cement. So that indicators of healthy house walls have walls that have been plastered (Ministry of Health RI, 2011).

The results of this study are in accordance with research conducted by Citra (2014) which shows that there is a relationship between the type of wall and the incidence of pulmonary TB (Citra, 2014). Research conducted by Suherman (2014) shows that the physical environmental factors of the house in the form of house walls can affect the incidence of pulmonary tuberculosis in the Working Area of the Banyu Urip Health Center, Purworejo Regency (Suherman, 2014). The results of this study are also in accordance with research conducted by Bachtiar (2018), stating that the condition of the physical environment of the house that does not meet the requirements is a risk factor for pulmonary TB disease in the community. So the need for counseling about healthy homes to prevent transmission of pulmonary TB disease (Bachtiar, 2018).

The Relationship between Home Ventilation and the Incidence of Pulmonary Tuberculosis

The results showed that of the 68 subjects who had house ventilation that met the requirements, 10 (14.7%) had pulmonary TB. This was due to the presence of a house that had a ventilation area of > 10% of the floor area but was covered by curtains and rarely opened. Causes no exchange of air circulation from inside to outside the house and these conditions become a breeding ground for germs so that the occupants of the house can easily contract pulmonary TB disease.

There were 58 (85.3%) subjects who had house ventilation that met the requirements and did not experience pulmonary TB disease, this was because most of the subjects' house ventilation was in accordance with the Decree of the Minister of Health of the Republic of Indonesia Number 1077/MENKES/PER/V/2011 namely have ventilation area > 10% floor area. Most of the ventilation conditions in the subject's house are open (not covered by zinc or curtains) so that there is an exchange of air circulation from inside to outside the house and tuberculosis germs will die in an environment that has good air circulation.

The results of the study also showed that there were 26 subjects who had house ventilation that did not meet the requirements, consisting of 13 (50.0%) had pulmonary TB, this could happen because the room's ventilation area was below 10% of the floor area resulting in air exchange not being able to take place properly and become a breeding ground for tuberculosis germs so that the risk of increasing the transmission of pulmonary TB disease to residents of the house.

In addition, there were 13 (50.0%) subjects who did not experience pulmonary TB even though they had inadequate ventilation at home. This can be due to a good understanding of the occupants of the house to always maintain the cleanliness of the home environment, always open the windows in the morning so that sunlight can enter the house and the presence of family members who do not have the habit of smoking in the house. By doing these healthy behaviors can prevent transmission of pulmonary TB disease.

The house ventilation variable statistically has a significant relationship with the incidence of pulmonary tuberculosis ($p < \alpha$). This can happen because ventilation that meets the requirements can free room air from bacteria that cause

pulmonary TB because with ventilation there is a continuous exchange of air. Home ventilation that does not meet the requirements can be used as an indicator that there is a lack of understanding about a healthy home with proper ventilation, namely at least 10% of the area of the house. Ventilation functions to provide fresh and healthy air for the occupants.

According to Nasry (2016) states that poor ventilation will cause respiratory health problems in the occupants. Transmission of respiratory tract diseases such as pulmonary TB is caused because the bacteria that cause pulmonary TB will settle in the house and the occupants of the house who have pulmonary TB will certainly be at risk of infecting other residents (Nasry, 2016). This is in accordance with the theory which states that ventilation functions to change the air in the room so that the air in the room is fresh air. Ventilation area that does not comply with health requirements will have an impact on reduced oxygen levels, increased CO₂ gas levels, stuffy room odors, indoor air temperature rises, and indoor air humidity increases. Increasing CO₂ gas levels increases the growth of *Mycobacterium tuberculosis* (Amir, 2015).

The results of this study are also in accordance with research conducted by Dwi (2014) showing that the physical environmental factors of the house in the form of house ventilation have a relationship to the practice of DOTS strategy treatment with pulmonary TB disease in Tirto District, Pekalongan Regency (Dwi, 2014). The results of this study are in accordance with research conducted by Anggraeni (2015), showing that the quality of the physical environment of the house such as ventilation area is related to the incidence of pulmonary TB (Anggraeni et al., 2015).

Relationship between House Occupancy and the Incidence of Pulmonary Tuberculosis

Based on the results of the study, it was shown that of the 62 subjects who had housing that met the requirements, 6 (9.7%) had pulmonary TB. as well as the habit of smoking members of the occupants of the household can allow transmission of TB germs to other occupants of the household.

In addition, there were 56 (90.3%) subjects who did not experience pulmonary TB. This could be due to the fact that the occupants of the house had implemented healthy behaviors such as routinely cleaning the house from dirt and dust, opening windows in the morning so that sunlight could enter the house, exercising regularly, and not smoking so that it is possible for him not to experience respiratory diseases, especially pulmonary TB disease.

The results of the study also showed that there were 33 subjects who had residential density that did not meet the requirements, consisting of 17 (53.1%) had pulmonary TB disease. This can be because the area of the house does not match the number of residents who live, there are houses consisting of several heads of families, there are also families that even occupy one house with 8-12 people, there is still a lack of habit of cleaning the house, opening windows in the morning and the lack of awareness from family members not to smoke causes easy transmission of pulmonary TB to residents of the house.

Whereas 15 (46.9%) subjects did not experience pulmonary TB disease even though they had a residential density that did not meet the requirements, this

could happen because none of the occupants of the house had pulmonary TB, there was a habit of the occupants of the house to always open windows in the morning day so that sunlight can enter the house, do regular exercise and have family members who do not have the habit of smoking in the house. By doing these healthy behaviors can prevent transmission of pulmonary TB disease.

When viewed from its relationship with the incidence of pulmonary TB disease, the density of house occupancy has a relationship with the incidence of pulmonary TB disease ($p < \alpha$). This can happen because basically houses with dense residential conditions can cause the air temperature in the house to increase. The denser the occupants of the house, the easier and faster the transfer of diseases, especially diseases through the air. Therefore, a house that is not densely populated can affect the breathing air of the occupants and reduce the risk of pulmonary TB disease, especially in the occupants of the house.

The results of this study are supported by a theory which states that the higher the density of houses, the faster the transmission of diseases, especially through the air. A densely populated house will cause poor air circulation, incomplete oxygen exchange and exacerbated if the ventilation of the house does not meet the requirements. This is very dangerous if there are family members who suffer from respiratory problems caused by viruses, they will quickly attack other family members due to breathing the same polluted air. The denser the occupants in the house, the easier it will be for transmission of disease to toddlers, especially diseases caused by air pollution such as respiratory problems or pulmonary TB disease (Amir, 2015).

Various studies have shown that there is a significant relationship between occupancy density and the occurrence of pulmonary TB, such as research by Wulandari (2014) which states that occupancy density has an effect on the incidence of pulmonary TB, which is 2.27 times that of a densely populated house compared to a non-densely populated house. (Wulandari, 2014). The results of this study are also in accordance with research conducted by Prasetyowati (2014) through the chi square test showing that there is a relationship between occupancy density and the risk of TB infection in elementary school children in Jember Regency (Prasetyowati, 2014).

The results of this study are in accordance with the results of Nur Syamsi's research (2015) which states that there is a relationship between house occupancy and the incidence of pulmonary TB in the work area of the Bontosikuyu Health Center, Selayar Islands Regency (Syamsi, 2014).

The Relationship between Smoking Habits and the Incidence of Pulmonary Tuberculosis

The results showed that out of 50 subjects who had smoking habits, 19 (38.0%) had pulmonary TB. The habit of smoking in the house and also the habit of closing room ventilation when smoking allows cigarette smoke to clot and last a long time indoors, causing respiratory diseases such as pulmonary TB in other family members who live in the same house.

In addition, there were 31 (62.0%) subjects who did not experience pulmonary TB disease even though they had smoking habits. This can happen because most of the respondents who have smoking habits keep their exposure to cigarette smoke away from other family members such as smoking in certain room areas

that have good air circulation so that cigarette smoke does not clot and last long in the room. However, respondents who have smoking habits have a greater risk of experiencing health problems caused by smoking itself.

The results of this study also showed that there were 44 subjects who did not have smoking habits, consisting of 4 (9.1%) had pulmonary TB. Subjects who experience pulmonary TB disease even though they don't have a smoking habit can also occur because of dirty living conditions and the observation results show that people still have the habit of closing air vents using curtains so that air circulation in the house becomes less effective and this is which causes disturbances in the respiratory tract such as coughing which if left longer than 14 days will become pulmonary TB disease.

In addition, there were 40 (90.9%) subjects who did not have smoking habits and did not experience pulmonary TB. This can be due to good awareness and understanding of the subject and family members to implement clean and healthy living behaviors such as not smoking, maintaining the cleanliness of the living environment, always checking the health condition of every family member at the health center, especially children under five, by routinely bringing their toddlers to the posyandu.

When viewed from its relationship with the incidence of pulmonary TB, the smoking habit variable has a relationship with the incidence of pulmonary TB ($p < \alpha$). This shows that the more family members who do not have smoking habits, the better the family's actions in preventing pulmonary TB disease. However, in this study there were still subjects and family members who did not have smoking habits but had pulmonary TB.

The results of this study are supported by the theory of exposure to cigarette smoke which states that the effect of cigarette smoke on passive smoking is three times worse than coal dust. Cigarette smoke spread by other people can cause various diseases, not only in adults but especially in infants and children. Toddlers and children whose parents are smokers are more susceptible to pulmonary TB and other respiratory tract diseases. Harmful gases in cigarette smoke stimulate the formation of mucus, dust and bacteria that have accumulated that cannot be removed, causing chronic bronchitis, paralysis of the elastin fibers in the lung tissue resulting in reduced lung pumping power, air is trapped in the lungs and results in rupture of the air sacs (Depkes RI, 2015).

The habit of smoking indoors or outdoors has an important role in the occurrence of pulmonary TB. Cigarette particle size and other chemicals have a role in the emergence of airway inflammation. Another theory states that smoking can cause structural changes in Mycobacterium exposure. The function of lung fluid production will also increase for both normal people and those affected by pulmonary tuberculosis. Cigarettes also cause changes in natural and acquired cell immunity which affect macrophages and leukocytes (Aditama, 2014).

Smoking can weaken the lungs and make the lungs more easily infected with tuberculosis bacteria. The existence of smoking habits in a person will make it easier to be infected with pulmonary TB. The results of statistical tests stated that toddlers who live with residents who smoke have a 2.04 times greater risk

of developing pulmonary TB compared to toddlers who don't have residents who smoke. Therefore, to protect babies/children from cigarette smoke, it is necessary to try not to smoke inside the house, or to provide a special place for families who smoke so that the smoke does not spread to other rooms in the house (Anggraeni et al., 2015).

The results of this study are also in accordance with the results of Safwan's research (2018) which states that there is a relationship between smoking habits and the incidence of pulmonary TB. The longer someone smokes, the more susceptible they are to infectious diseases and someone who has smoking habits has a 16 times greater risk than someone who doesn't smoke (Safwan, 2018).

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the research that has been done, the conclusions in this study are: there is a relationship between the physical condition of the house (walls, ventilation, occupancy) and smoking habits with the incidence of Pulmonary Tuberculosis in the Work Area of the Mawasangka Tengah Health Center, Central Buton Regency. Suggestions in the form of: it is necessary to provide information from the Central Mawasangka Public Health Center in order to increase understanding of Pulmonary Tuberculosis and its prevention efforts. The results of this study can be a source of information for the Mawasangka Tengah Public Health Center in Buton Tengah Regency to improve direct counseling and counseling as an effort to prevent environment-based diseases. The recommendations is for the health center to provide continuous counseling in the form of education about the physical condition of the house that meets the requirements to avoid TB and education about the dangers of smoking.

FURTHER STUDY

For future researchers to reveal more clearly the factors that influence the incidence of pulmonary tuberculosis in central Buton.

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