



## The Relationship between Smoking Behavior and the Incidence of Tuberculosis at the Medan Sunggal Public Health Center

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### ABSTRACT

Tuberculosis is an infectious disease caused by bacteria in the form of rods (bacilli) known as *Mycobacterium tuberculosis*. This disease is included as a chronic infectious disease. The causes of the increase in TB cases each year are still various. One of them is smoking behavior. A person who smokes will have twice the risk of contracting TB. This study aims to determine the relationship between smoking behavior and the incidence of pulmonary tuberculosis in the work area of the Medan Sunggal Puskesmas in 2019. This study is an analytical study with a cross sectional design. The population of this study were patients with pulmonary TB in the work area of the Medan Sunggal Public Health Center in 2019. The sample size used was 104 people who had met the inclusion and exclusion criteria. In the second study, the data collection tool was through the Puskesmas medical records. Data analysis was performed using the statistical test is chi square. the result showed that there was a relationship between smoking behavior and the incidence of pulmonary tuberculosis in Medan Sunggal Public Health Center with an OR (95% CI) value of 105,125 (13,280-832,161), which means that respondents who smoke will have 105,125 times the risk of suffering from pulmonary tuberculosis compared to non-smoking respondents. From the results of 95% CI, it can be seen that the lower limit and upper limit values (CI values) not include 1.00, so the results of the study are statistically significant at the value of  $\alpha = 0.001$ . Smoking behavior has an insignificant relationship with the incidence of pulmonary tuberculosis at Medan Sunggal Puskesmas in 2019. It is recommended that the primary care should provide support and sources of information about smoking habits, especially for patients who have been diagnosed with pulmonary TB.

### 1. Introduction

Tuberculosis is an infectious disease caused by bacteria in the form of *Mycobacterium tuberculosis* bacillus and is considered a chronic infectious disease <sup>(1)</sup>. These bacteria are also known as Acid Resistant Bacteria (BTA) <sup>(2)</sup>. The process of transmitting TB infection through coughs or the common cold with *droplets or airbornes* that attack various organs of the body <sup>(3)</sup>.

According to WHO (2015), 9.6 million TB cases each year in the world with a death rate reaching 1.5 million. Some are children aged <15 years. Among these 9.6 million cases, 480.000 were drug-resistant TB (RO-TB) cases <sup>(4)</sup>. The five countries with the highest incidence of TB cases are India, Indonesia, China, the Philippines and Pakistan <sup>(5)</sup>.

New TB cases in Indonesia in 2017 were 420,994 cases with the number of TB cases in men 1.4 times



greater than that of women. Men are more exposed to TB risk factors such as smoking and less medication non-adherence (6). Currently, Indonesia is facing a serious threat due to the increasing number of smokers. It is predicted that more than 97 million Indonesians are exposed to cigarette smoke (7). Nationally, the prevalence of smokers is 29%. In North Sumatra Province, the prevalence of smokers aged  $\geq 10$  years is 28.4% (8).

The relationship between smoking and TB first appeared in the early 20<sup>th</sup> century. Cigarettes contain more than 4500 chemicals that are toxic, mutagenic, and carcinogenic (9). The association of smoking with TB cases results from a decrease in the level of proinflammatory cytokines, thereby decreasing the initial local defense response to TB infection. In addition, smoking can also interfere with the clarity of the cilia mucosa as an initial defense against infections of the respiratory tract (10).

Smoking has twice the risk of getting TB. Research in Russia found the TB disease due to smoking was around 31.6% and the death rate for smokers with TB cases was 28.1% (11). So, researchers are interested in researching the relationship between smoking behavior and the incidence of tuberculosis at the Medan Sunggal Puskesmas in 2019.

## 2. Methods

This study was an analytical research with cross sectional design. The research was conducted at the Medan Sunggal Puskesmas in June 2020. The study population was all patients who underwent pulmonary tuberculosis examination at the Medan Sunggal Public Health Center. The sample size was 104 patients who met the inclusion and exclusion criteria. Primary data collection by interview method and secondary data from medical records. Univariate analysis and chi square.

## 3. Results and Discussion

The frequency distribution of respondent characteristics can be seen in table 1 below. In table 1 above, the majority of respondents are aged

36-46 years (27.9%), female (51.9%), high school education (47.1%), and working (53.8%). The frequency distribution of pulmonary tuberculosis can be seen in table 2 below. In table 2 above, most respondents suffer from pulmonary tuberculosis (71.2%). The frequency distribution of symptoms felt by respondents before performing pulmonary tuberculosis can be seen in table 3 below. In table 3 above, the most common symptom felt by respondents before doing the examination of pulmonary tuberculosis was coughing with phlegm for more than 2 weeks (71.2%). The distribution of the frequency of smoking activities of respondents can be seen in table 4 below. In table 5 above, the most smoking activity is smoking respondents (56.7%), non-filter cigarettes (59.3%), the number of cigarettes consumed by respondents per day is  $\leq 10$  cigarettes (94.9%), smoking duration  $> 10$  years (71.2%), and the degree of smoking was mild (57.6%). The relationship between smoking behavior and pulmonary tuberculosis can be seen in table 5 below. Chi square test results obtained p value = 0.001 (p value  $< 0.05$ ), which means that there is a relationship between smoking behavior and the incidence of pulmonary tuberculosis at the Medan Sunggal Health Center. The results of this test also obtained an OR value (95% CI) of 105.125 (13.280-832.161), which means that respondents who smoke will have a 105.125 times risk of suffering from pulmonary tuberculosis compared to respondents who do not smoke. From the results of the 95% CI it can be seen that the lower limit and upper limit values (CI values) do not include 1.00, so the results of the study are statistically significant at the value  $\alpha = 0.001$



Table 1. Characteristics of respondents

Characteristics	Frequency	Percentage
Age		
17-25 years	13	12.5
26-35 years	15	14.4
36-45 years	29	27.9
46-55 years	21	20.2
56-65 years	20	19.2
> 65 years	6	5.8
Gender		
Man	50	48.1
Women	54	51.9
Education		
Primary school	13	12.5
Junior High	34	32.7
High school	49	47.1
Bachelor	8	7.7
Profession		
Work	56	53.8
Does not work	48	46.2

Table 2. Incidence of pulmonary tuberculosis

Pulmonary TB incidence	Frequency	Percentage
Suffer	74	71.2
Don't suffer	30	28.8

Table 3. Symptoms felt by respondents before performing pulmonary tuberculosis examination

No	Symptoms	Yes		No	
		f	%	f	%
1	Cough with phlegm	74	71.2	30	28.8
2	> 2 weeks	29	27.9	75	72.1
3	Coughing up phlegm mixed with blood	75	72.1	29	27.9
4	Chest pain	73	70.2	31	29.8
5	Out of breath	72	69.2	32	30.8
6	Weak body	61	58.7	43	41.3
7	Sweating at night without doing physical activity	59	56.7	45	43.3
8	Weight loss	42	40.4	62	59.6



Table 4. Smoking activity

Smoking activity	f	%
Smoking behavior		
Smoke	59	56.7
Do not smoke	45	43.3
Filter		
Filter	24	40.7
Non filter	35	59.3
The number of cigarettes consumed per day		
≤10 sticks	56	94.9
> 10 sticks	3	5.1
Duration of smoking		
≤10 years	17	28.8
> 10 years	42	71.2
Smoking degrees		
Light	34	57.6
Moderate	21	35.6
Weight	4	6.8

Table 5. The relationship between smoking behavior and pulmonary tuberculosis

Smoking behavior	The TB incident					
	Suffer		Don't suffer		Total	
	f	%	f	%	F	%
Smoke	58	98.3	1	1.7	59	100.0
Don't smoke	16	35.6	29	64.4	45	100.0

  

P value	OR
0.001	105.125 (13.280 – 832.161)

### The TB incident

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* and attacks various organs, especially the lungs (12). The results of this study found that there were more people with pulmonary tuberculosis than respondents who did not suffer from pulmonary tuberculosis. The results of the previous research also showed that the respondents who suffered from pulmonary tuberculosis were more (13) (14).

Pulmonary tuberculosis is an infectious disease that is still a public health problem (13). TB germs can be transmitted through saliva when a person coughs or sneezes. The droplets of saliva fly in the air and are sucked in by healthy people, as a result it will enter the lungs and cause pulmonary tuberculosis (15).

### Smoking Behavior

Smoking is one of the risk factors that can reduce the body's resistance to TB bacteria (16). Smoking



behavior is the biggest problem for the risk factors for pulmonary tuberculosis in Medan Sunggal Puskesmas. This can be seen from the results of the study that the respondents who smoked pulmonary tuberculosis were more than respondents who did not smoke. Research by Riza and Sukendra (2017) is in line with the results of this study that the number of TB patients who smoke is more than those who do not smoke <sup>(17)</sup>.

Based on the length of smoking, the results showed that respondents who had smoked > 10 years were more than respondents who had smoked ≤ 10 years. In line with Wahyudi's research (2017) that respondents who had smoked cigarettes for ≥ 10 years were more at Long-Inpatient Puskesmas <sup>(13)</sup>. However, it is different from other studies that the average TB patients who have smoked > 10 years are more <sup>(17)</sup>.

According to Bustam (2007), age at initiation of smoking with length of smoking history has a relationship <sup>(17)</sup>. Cigarettes have a dose-response effect, meaning that the younger the smoking age, the greater the effect. Duration of smoking is also a risk for the entry of TB germs. Chronic exposure to cigarette smoke can damage alveolar macrophages in the lungs and affect the immunity of T cells. As a result, the TB bacteria are resistant to tuberculosis drugs <sup>(18) (19)</sup>.

Based on the number of cigarettes consumed per day, the results showed that respondents who consumed cigarettes ≤ 10 cigarettes per day were more than respondents who consumed cigarettes > 10 cigarettes per day. This result is in line with previous research conducted at the Puskesmas in Long Hospital where the number of respondents with ≤ 10 cigarettes was more <sup>(13)</sup>.

According to Bustan (1997), the number of cigarettes smoked can be in sticks, packs per day. Various harmful chemicals in cigarettes are materials that are very dangerous for the human body. Statistical data shows 90% of deaths are due to respiratory problems, 25% of deaths due to emphysema and smoking habits. The more people who smoke, the greater the risk of getting pulmonary tuberculosis <sup>(13)</sup>.

Based on the type of filter, the results showed that there were more respondents with non-filter cigarettes than respondents with filter cigarettes. These results are consistent with previous studies that patients who experienced conversion failure consumed more non-filter cigarettes <sup>(13)</sup>. However, it is different from the research of Murfikin et al (2014) <sup>(20)</sup>.

According to Bustan (1997), filter cigarettes are divided into 2, namely filter cigarettes and non-filter cigarettes. Filter cigarettes filter some of the tar and reduce the nicotine content by 25-50%. The nicotine content in filter cigarettes is 14-28mg per stick. A greater nicotine content and no filter has a greater risk of nicotine entry into the lungs <sup>(13)</sup>.

Based on the Brikman index, the results showed that the majority of respondents' smoking degrees were mild. These results are in line with previous studies that the mean TB sufferers were male smokers with a severe degree. The tendency to become a heavy smoker is that nicotine is very addictive, causing dependence on cigarettes and if it is stopped it will cause complaints such as difficulty concentrating and lack of confidence <sup>(21)</sup>.

In this study, the most common symptom experienced by respondents before performing pulmonary tuberculosis was cough with phlegm > 2 weeks. In line with previous studies that the most clinical symptom of TB patients was cough > 3 weeks <sup>(21)</sup>. Every year the frequency of smoking-related patients increases. A lot of research and authentic evidence states that smoking is like a time bomb that can damage health. Because smoking can create a sense of addiction. The nicotine in cigarettes has a relaxing effect that makes this habit difficult to break <sup>(22)</sup>.

### **The relationship between smoking behavior and pulmonary tuberculosis at the Medan Sunggal health center**

Based on the results of the chi square test, it was found that there was a relationship between smoking behavior and the incidence of pulmonary tuberculosis in Medan Sunggal Health Center. Respondents who smoke have a 105.125 times risk



of suffering from pulmonary tuberculosis than respondents who do not smoke. These results are in accordance with the research of Romlah (2015) that there is a significant relationship between smoking and the incidence of pulmonary tuberculosis with a large risk of 3.44 times <sup>(23)</sup>. It is also in line with research by Sejati and Sofiana (2015) that there is a significant relationship between smoking and pulmonary tuberculosis <sup>(24)</sup>. However, in contrast to the results of research Ernawati et al (2017) and Kurniasari et al (2012) are different from this study.<sup>(12) (25)</sup>

Smoking behavior can interfere with the effectiveness of some respiratory defense activities. Smoking habits can damage the lungs and mucociliary clearance mechanisms. In addition, cigarette smoke also increases airway resistance and permeability of the pulmonary epithelium and impairs the motion of cilia, macrophages increase storefront synthesis and decrease antiprotease production <sup>(26) (27)</sup>.

#### 4. Conclusion

Based on the results of research on the characteristic frequency distribution shows that the majority of respondents are aged 36-45 years (27.9%), female (51.9%), high school education level (47.1%), and work (53.8% ). Based on the results of research on the frequency distribution of smoking behavior shows that the majority of respondents smoke (56.7%). Based on the results of research on the frequency distribution of pulmonary tuberculosis, it shows that the majority of respondents suffer from pulmonary tuberculosis (71.2%). Based on the results of the chi square test, it shows that there is a relationship between smoking behavior and the incidence of pulmonary tuberculosis at the Medan Sunggal Health Center (p value = 0,001). OR value (95% CI) 105,125 (13,280-832,161) means that respondents who smoke will have 105,125 times the risk of suffering from pulmonary tuberculosis than respondents who do not smoke. From the 95% CI results, it can be seen that the lower limit and upper limit values (CI values) do not include 1.00, so the

results of the study are statistically significant at the value  $\alpha = 0.001$ .

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