

THE ASSOCIATION OF SMOKING HISTORY WITH TREATMENT DURATION IN PATIENTS WITH PULMONARY TUBERCULOSIS IN INPATIENT WARD AT GENERAL HOSPITAL EAST JAKARTA INDONESIA 2025

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ABSTRACT

Background: Pulmonary tuberculosis (TB) is a contagious infectious disease that remains a global and national health problem. Indonesia is among the eight countries with the highest TB burden in the world. The success of pulmonary TB treatment is greatly influenced by patient adherence to the 6–9-month therapy regimen. One factor associated with influencing the duration of treatment is smoking. Smoking can damage the lungs' defense mechanisms, impair mucociliary function, and weaken the immune system, potentially slowing the healing process and increasing the risk of treatment discontinuation. The high prevalence of smokers in Indonesia makes this factor important to study, particularly among pulmonary TB patients undergoing inpatient care.

Objective: This study aims to determine the relationship between smoking history and treatment duration among pulmonary TB patients in the Edelweis Barat inpatient ward at Budhi Asih Regional General Hospital, East Jakarta, in 2025.

Methods: This study employed a cross-sectional design with a quantitative correlational approach. Sampling was conducted using probability sampling via simple random sampling, involving 76 respondents. Data were collected via a questionnaire and analyzed using the Chi-Square statistical test.

Results: The results of the study showed that respondents with moderate and high smoking behavior were equally represented, with 38 respondents (50%) in each group. The most common duration of treatment was >9 months, with 28 respondents (36.8%), followed by 6–9 months

with 25 respondents (32.9%), and 0–6 months with 23 respondents (30.3%). Most respondents with high smoking behavior had a treatment duration of >9 months, totaling 28 respondents (73.7%). The Chi-Square test results showed a p-value of 0.001, indicating a significant association between smoking history and treatment duration in pulmonary TB patients.

Conclusion: There is a significant association between smoking history and treatment duration in pulmonary TB patients. High smoking behavior tends to be associated with longer treatment duration.

Keywords: *Pulmonary Tuberculosis, Smoking History, Treatment Duration, TB Patients*

Introduction

Respiration, also known as breathing, is the process of inhaling ambient air containing O₂ (oxygen) and exhaling CO₂ (carbon dioxide)—a byproduct of oxidation—out of the body. The process of inhaling oxygen is called inspiration, while the process of exhaling carbon dioxide is called expiration. In respiration, oxygen is the primary substance. Oxygen is obtained from the surrounding environment. The organ that plays a vital role in the respiratory process is the lungs. The respiratory system consists of the nose, pharynx, larynx, trachea, bronchi, bronchioles, and alveoli. Respiration specifically the exchange of O₂ and CO₂ occurs in the lungs, more precisely within the alveoli, (Utama, 2018).

Menurut World Health Organization dalam Global TB Report tahun 2023 TBC masih menjadi masalah kesehatan di dunia hingga saat ini. TBC menjadi penyebab kematian tertinggi kedua di dunia setelah COVID-19 pada tahun 2022. Lebih dari 10 juta orang terjangkit penyakit TBC setiap tahunnya. Tanpa pengobatan, angka kematian akibat penyakit TBC tinggi (sekitar 50%). Secara global pada tahun 2022, TBC menyebabkan sekitar 1,30 juta kematian. Dengan pengobatan yang direkomendasikan WHO, 85% kasus TBC bisa disembuhkan. Jumlah orang yang baru didiagnosis sakit TBC secara global adalah 7,5 juta pada tahun 2022. Tiga puluh negara dengan beban TBC tinggi menyumbang 87% kasus TBC dunia pada tahun 2022 dan dua pertiga dari total global terjadi di delapan negara: India (27%), Indonesia (10%), Cina (7.1%), Filipina (7,0%), Pakistan (5,7%), Nigeria (4,5%), Bangladesh (3,6%) dan Republik Demokratik Kongo (3,0%). Pada tahun 2022, 55% pasien TBC adalah laki- laki, 33% perempuan, dan 12% adalah anak-anak (usia 0–14 tahun).

The number of TB patients in DKI Jakarta in 2020 was 22,156, and this figure increased to 26,854 in 2021. Meanwhile, East Jakarta had the highest number compared to the other five regions, with 6,620 cases in 2020 and an increase to 8,222 cases in 2021 (DKI BPS, 2020). According to data from the DOTS clinic at Budhi Asih General Hospital, the number of patient visits from February 2024 to May 2024 totaled 313 patients, comprising 255 existing patients and 58 new patients.

Tuberculosis, commonly known as TB, is a disease caused by infection with the bacterium *Mycobacterium tuberculosis*; if not managed properly and effectively, it can be fatal. Most

patients with pulmonary TB can be cured with a course of antibiotic treatment lasting 6–9 months. If patients do not complete their treatment, TB can develop into drug-resistant TB. Treatment interruption is one of the factors contributing to low TB treatment success rates. According to the WHO, treatment interruption (lost to follow-up) refers to a situation where a patient does not undergo TB treatment or stops treatment for two consecutive months or more.

Based on data from TB treatment outcomes in Indonesia in 2023, the cure rate for TB treatment ranged from 18.2% to 71.2%, with the lowest rate recorded in 2021. The proportion of patients who discontinued treatment ranged from 2.1% to 7.7%, with the highest figure in 2023 (Yudhanti et al., 2025). Of course, smoking affects many other organ systems, but the lungs are the organs that suffer the most damage. Smoking affects the lungs and the immune system, making smokers more susceptible to tuberculosis (TB). In addition to its adverse effects on our immune cells, mechanical damage also occurs to the function of the cilia—tiny hair-like structures that act as a protective layer for lung tissue (Nasution et al., 2024).

Smoking is a major risk factor for cardiovascular disease and is often the leading cause of death worldwide in cases related to cerebrovascular disease, lower respiratory tract infections, COPD, tuberculosis, and all types of lung cancer (Giacomo M, et al., 2011). Smoking damages the lung's defense mechanism known as mucociliary clearance. Exposure to cigarette smoke can also stimulate mucus production and reduce ciliary movement, leading to mucus buildup and an increased risk of bacterial growth, which can result in infection (Susanti et al., 2013).

Currently, the WHO reports that 34.5% of adults—or 70.2 million people—use tobacco. The percentage of tobacco use among men is 65.5%, and among women, 3.3%. E-cigarette use has increased tenfold over the past 10 years, from 0.3% in 2011—when the previous Global Adult Tobacco Survey (GATS) was conducted—to 3% in 2021. This report finds that exposure to secondhand smoke in public places remains high. A total of 74.2% of adults were exposed to secondhand smoke in restaurants, and 44.8% at work. Nearly 78% of current smokers are aware of the health warnings on cigarette packaging. The number of smokers who want to quit has increased compared to 10 years ago; however, the proportion of tobacco users advised by healthcare professionals to quit has risen by only about 4 percentage points, from 34.6% to 38.9%. In Indonesia, approximately 225,700 people die each year due to smoking or other smoking-related diseases (WHO, 2020). The prevalence of active smoking in Indonesia continues to rise. Data from the 2023 Indonesian Health Survey (SKI) conducted by the Ministry of Health (Kemenkes) indicates that the number of active smokers is estimated to reach 70 million people, accounting for 7.4% of the population (Kemenkes, 2023).

Data from the Health Research and Development Agency (Litbangkes) show that smokers (including current smokers and former smokers) are three times more likely to develop pulmonary TB than nonsmokers. Active or passive exposure to tobacco increases the risk of tuberculosis. If someone in a household smokes, the risk of developing pulmonary TB increases ninefold; indeed, smoking is one of the factors that worsens lung conditions.

Research Method

This study employed an analytical observational design with a cross-sectional approach to examine the relationship between smoking history and treatment duration among patients with pulmonary tuberculosis (TB). The study was conducted in the Edelweis Barat Inpatient Ward of Budhi Asih Regional General Hospital, East Jakarta, Indonesia, in 2025. The study population consisted of all patients diagnosed with pulmonary TB who met the inclusion criteria during the study period. Data on smoking history were obtained from medical records and patient documentation, with participants categorized according to their smoking status and history. Treatment duration was measured based on the total length of anti-tuberculosis therapy recorded in the patients' medical records. A purposive sampling technique was used to select eligible participants, and demographic and clinical characteristics were also collected to describe the study population.

3.2 Operational Definition

No	Research Variable	Operational Defination	Measurem ent Instrument	Measurement Outcome	Scale
<i>Variabel Dependen</i>					
1.	Duration of OAT treatment	The total length of time, measured in months, from the initiation to the completion of anti-tuberculosis drug (OAT) therapy as documented in the patient's medical records.	Medical record review form	• Short treatment duration (0-6 month) • Moderate treatment duration (6-9 month) • Long treatment duration (>9 month)	Ordinal
<i>Variabel Independen</i>					
2.	Smoking History	A history of tobacco smoking documented in the patient's medical records.	40-item Smoking History Questionnai re using a Likert scale	1. Mild (score 40-95) 2. Severe (score 96-160)	Ordinal

Research Population and Sample

Research Population

A population is the domain of generalization consisting of objects or subjects that possess certain qualities and characteristics defined by the researcher for study, from which conclusions are subsequently drawn, Sugiyono (2013). The population in this study consisted of patients with pulmonary TB treated in the Edelweis Barat inpatient ward at Budhi Asih Regional General Hospital, totaling 313 individuals over the past 4 months.

Populasi dalam penelitian ini adalah semua ibu akseptor KB dari Pasangan Usia Subur (PUS) yang menggunakan kontrasepsi di Puskesmas Sungai Lebung Kecamatan Pemulutan Selatan Kabupaten Ogan Ilir Provinsi Sumatera Utara Tahun 2024 yang berjumlah 628 orang

Sampel Penelitian

Sampel merupakan sebagian atau perwakilan dari populasi yang diteliti. Sampel menjadi bagian dari jumlah populasi yang diteliti sehingga hasil penelitian bisa digeneralisasikan. Pengambilan sampel dengan menggunakan rumus Slovin ((Hamdi & Bahrudin, 2014).

Sampling Technic

The sampling technique used in this study is non-probability sampling, which is a sampling method that does not give every member of the population an equal chance of being selected as a sample (Sugiyono, 2018). This study employs purposive sampling. Purposive sampling is a technique for determining a sample by selecting samples from the population according to the researcher's criteria, so that the sample can represent the characteristics of the population that are known beforehand (Nursalam, 2019).

The inclusion criteria for this study are:

- Patients who have undergone treatment for pulmonary TB for at least 1 month
- Patients with pulmonary TB aged 20–50 years
- Patients with pulmonary TB, with or without other comorbidities.
- Patients with pulmonary TB who are willing to participate as study subjects
- Patients with pulmonary TB who have a history of smoking

The exclusion criteria for this study are:

- Patients with pulmonary TB who have complications and a poor prognosis

Research Instrument

This research instrument consists of data collected through a smoking history questionnaire and data on the duration of pulmonary TB treatment, which are included in the

respondents' characteristics. The variables to be studied are described in the questionnaire and used as a data collection tool.

The smoking history questionnaire was adapted from a previous study (Sabaruddin, 2024) and consists of 40 questions using a Likert scale with response options of always, often, sometimes, and never. Each question in this questionnaire covers several key aspects for assessing smoking history, including the number of cigarettes consumed (3 statements), smoking activities (9 questions), time spent smoking (4 questions), timing (6 questions), public places (3 questions), private places (3 questions), psychological factors (9 questions), and reasons for smoking (3 questions).

Research Location

The research involved the preparation, implementation, and report-writing phases. The entire research project took place from December 2025 to January 2026. The research was conducted in the Edelweis Barat Inpatient Ward at Budhi Asih Regional General Hospital in East Jakarta.

Data Processing and Analysis Techniques

Data Processing

Data processing is divided into four stages, namely:

1.Editing

Editing involves reviewing the questionnaire that the researcher administered to the research respondents through interviews. The researcher checks the completed questionnaires for factors such as the completeness of responses, legibility of handwriting, and the relevance of the respondents' answers.

2.Coding

This is the stage of grouping data from the answers provided by respondents according to research variables. The purpose of coding is to facilitate the tabulation process and subsequent data analysis stages.

3.Processing

Processing is the process of entering data into tables using computer software. Subsequently, the questionnaire data and measurements that have been coded by the researcher are entered into the computer program's tables.

4.Cleaning

This is the stage of rechecking the data that has been entered to verify for errors, missing data, and data consistency.

Data Presentation

Univariate Data Analysis The findings of the univariate analysis are used to describe the smoking history and the duration of pulmonary TB treatment received. Categorical variables are described using frequency distribution tables and percentages or proportions.

Bivariate Data Analysis

Bivariate analysis is used to determine the relationship between smoking history and the duration of treatment in pulmonary TB patients in the Edelweis Barat Inpatient Ward at Budhi Asih Regional General Hospital. The statistical test for this categorical data uses the chi-square test.

Result

Univariate Analysis

This study examines the relationship between smoking history and the duration of pulmonary TB treatment among inpatients at Budhi Asih Regional General Hospital from December 2025 to January 2026. The study employed a primary data collection method using questionnaires administered to the respondents. Using univariate data on the respondents' smoking history and the duration of their pulmonary TB treatment.

Table 1

Table 1. Overview of Patients' Smoking Behavior

Smoking Behavior	Frequency (n)	Percentage (%)
Mild	38	50%
Severe	38	50%
Total	76	100%

Sumber: data primer diolah (2025)

Based on the results of the univariate analysis in Table 4.1, it was found that respondents with light smoking habits and heavy smoking habits accounted for the same proportion, with 38 respondents (50%) in each group.

Table 2
Overview of Respondents' Duration of Treatment

Duration of Treatment	Frequency (n)	Percentage (%)
0–6 months (Short)	23	30.3%
6–9 months (Moderate)	25	32.9%
>9 months (Long)	28	36.8%
Total	76	100%

Sumber: data primer diolah (2025)

Based on the results of the univariate analysis in Table 4.2, it was found that respondents with a treatment duration of more than 9 months constituted the largest group, comprising 28 respondents (36.8%). Next, respondents with a treatment duration of 6–9 months numbered 25 (32.9%), while those with a treatment duration of 0–6 months numbered 23 (30.3%).

Bivariate Analysis

Tabel 4.3 The Association Of Smoking History With Treatment Duration In Patients With Pulmonary Tuberculosis In Inpatient

Smoking Behavior	Duration of TB Treatment			Total N	P-value
	0–6 Months	6–9 Months	>9 Months		
	N (%)	N (%)	N (%)	N	
Light Smoker	23 (60.5)	15 (39.5)	0 (0.0)	38	0.001
Heavy Smoker	0 (0.0)	10 (26.3)	28 (73.7)	38	
Total	23 (30.3)	25 (32.9)	28 (36.8)	76	

The table above shows that the majority of respondents who were heavy smokers and had been undergoing treatment for more than 9 months numbered 28 (73.7%), with a p-value of 0.001.

Discussion

Univariate Analysis

Respondents' Smoking Behavior

Based on the results of a study of pulmonary TB patients treated at Budhi Asih Regional General Hospital, it was found that respondents with light and heavy smoking habits were equally represented, each accounting for 50%. This finding indicates that all respondents still engage in smoking to a significant degree even while undergoing treatment for pulmonary TB. This condition indicates that smoking habits remain difficult to quit and continue to be part of

pulmonary TB patients' lifestyles. The Ministry of Health of the Republic of Indonesia (2020) states that smoking is a major risk factor for lung disorders, including pulmonary TB, as it can weaken the respiratory tract's resistance and increase susceptibility to infection.

The persistently high prevalence of smoking among pulmonary TB patients may be influenced by the duration of their smoking history prior to a TB diagnosis. Habits that have persisted over a long period tend to be difficult to quit even after patients become aware of their condition. This aligns with the study by Rahman et al. (2021), which reported that the majority of pulmonary TB patients have moderate to heavy smoking habits, particularly among those with a long-term smoking history. High smoking intensity is known to be associated with worsening clinical conditions in pulmonary TB patients.

Additionally, patients' low awareness of the impact of smoking on the healing process also contributes to high smoking rates. Patients who continue to smoke during treatment are at risk of experiencing obstacles in the recovery process because exposure to cigarette smoke can damage lung tissue and interfere with the effectiveness of therapy. Bates et al. (2007) stated that active smokers have a higher risk of TB treatment failure compared to non-smoking patients, and require a longer time to achieve negative sputum conversion.

Smoking behavior is also associated with adherence to TB treatment. Patients who smoke tend to have lower adherence to their treatment regimen, both in terms of taking medication regularly and attending follow-up appointments. This condition can increase the risk of relapse and the development of TB drug resistance. Previous research has shown that pulmonary TB patients who smoke have a higher risk of experiencing pulmonary complications and treatment failure compared to non-smoking patients (Rahman et al., 2021).

The balanced proportion of light and heavy smoking behaviors in this study indicates that smoking remains a significant health issue among pulmonary TB patients. This habit has the potential to prolong the duration of treatment and hinder improvements in lung function. Therefore, the involvement of healthcare workers, particularly nurses, is essential in providing education, counseling, and support regarding smoking cessation as an integral part of efforts to improve the success of pulmonary TB treatment.

Duration of treatment for pulmonary TB among respondents

Based on the results of a study of pulmonary TB patients hospitalized at Budhi Asih Regional General Hospital, it was found that respondents with a treatment duration of more than 9 months constituted the largest group, totaling 28 respondents (36.8%). This finding indicates that some pulmonary TB patients undergo treatment for a relatively long period. This situation indicates the presence of certain factors influencing the duration of pulmonary TB treatment, particularly among patients requiring inpatient care. The Ministry of Health of the Republic of Indonesia (2020) states that the duration of pulmonary TB treatment can be influenced by the severity of the disease and the patient's response to therapy.

Treatment durations exceeding 9 months may be associated with varying clinical conditions, as some patients are admitted in already severe conditions. Patients with severe clinical conditions tend to require intensive monitoring and extended therapy over a longer period to achieve optimal clinical improvement. This aligns with the statement by the Ministry of Health of the Republic of Indonesia (2020), which states that patients with severe clinical conditions or specific complications require a longer treatment duration compared to those with mild conditions.

In addition to the severity of the disease, patient adherence to treatment also plays a crucial role in determining the duration of pulmonary TB treatment. Suboptimal adherence can hinder the healing process, thereby prolonging the duration of therapy. The Ministry of Health of the Republic of Indonesia (2020) notes that irregular medication intake and non-compliance with follow-up appointments can lead to poor treatment response and prolong the duration of pulmonary TB treatment.

Behavioral factors, such as smoking, also contribute to the length of the pulmonary TB treatment process. Smoking is known to reduce lung function and weaken the body's immune response to *Mycobacterium tuberculosis* infection, thereby slowing the recovery process. This is supported by a study by Siregar et al. (2021), which states that pulmonary TB patients with risk factors such as smoking tend to require a longer treatment duration compared to patients without such risk factors.

The fact that the largest proportion of respondents in this study had a treatment duration of more than 9 months indicates that the treatment of pulmonary TB in hospitalized patients still requires a relatively long time. This suggests that the recovery process for pulmonary TB is influenced by various factors, such as treatment adherence and patient behavior. Prolonged treatment duration has the potential to impact patients' physical and psychological well-being, as well as their quality of life. Therefore, the role of healthcare workers, particularly nurses, is essential in monitoring therapy, improving treatment adherence, and providing ongoing education to support the success of pulmonary TB treatment and prevent unnecessary prolongation of the treatment duration.

Bivariate Analysis

Based on the results of the bivariate analysis, it was found that respondents with light smoking habits mostly underwent pulmonary TB treatment for 0–6 months (60.5%) and 6–9 months (39.5%), and no respondents with light smoking habits were found to have undergone treatment for more than 9 months. Conversely, among respondents with heavy smoking behavior, the majority underwent pulmonary TB treatment for more than 9 months, namely 28 respondents (73.7%), while the remainder underwent treatment for 6–9 months (26.3%). A statistical test using the Chi-Square test yielded a p-value of 0.001 ($p < 0.05$), indicating a statistically significant association between smoking behavior and the duration of pulmonary TB treatment among inpatients at Budhi Asih General Hospital.

This distribution pattern indicates that respondents with heavier smoking habits tend to undergo pulmonary TB treatment for a longer period of time compared to respondents with lighter smoking habits. This suggests a tendency for treatment duration to increase as the severity of smoking habits increases. The Ministry of Health of the Republic of Indonesia (2020) states that exposure to secondhand smoke can worsen lung tissue damage and slow the recovery process in pulmonary TB patients.

This situation is linked to a long history of smoking and the fact that some patients have not yet completely quit smoking while undergoing treatment for pulmonary TB. Additionally, patients with high smoking behavior also tend to have more severe clinical conditions and comorbidities, which can affect the speed of the healing process. This is supported by the Ministry of Health of the Republic of Indonesia (2020), which states that the severity of the disease and the presence of risk factors can prolong the duration of pulmonary TB treatment.

Theoretically, smoking behavior influences the duration of pulmonary TB treatment through various biological mechanisms. Harmful substances in cigarettes, such as nicotine, tar, and carbon monoxide, can damage lung tissue, disrupt cilia function, and reduce the local immune response of the respiratory tract, thereby slowing the elimination of *Mycobacterium tuberculosis*. The World Health Organization (2020) and the Ministry of Health of the Republic of Indonesia (2020) state that these conditions contribute to the length of the healing process and the duration of pulmonary TB treatment.

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In addition to biological effects, smoking behavior is also linked to patient behavior, particularly adherence to TB treatment. Patients who smoke heavily are at greater risk of non-adherence to medication, which can lead to delayed sputum conversion and prolong the treatment phase of pulmonary TB. Putra and Handayani (2020) noted that low treatment adherence is one of the key factors influencing the duration of pulmonary TB treatment.

These findings align with the research by Rahman et al. (2021) and Pratama et al. (2022), which stated that pulmonary TB patients with heavy smoking habits face a higher risk of undergoing treatment for a longer duration. However, these results do not align with the study by Lestari and Wijaya (2019), which stated that there is no significant association between smoking behavior and the duration of pulmonary TB treatment. These differences may be influenced by respondent characteristics, study design, and the implemented treatment monitoring system, where stricter treatment supervision can minimize the impact of smoking behavior on treatment duration (Indonesian Ministry of Health, 2020).

Conclusion and Suggestion

Conclusion

Based on the findings, all respondents had a history of smoking, with an equal distribution between light smokers and heavy smokers (50% each). Regarding the duration of pulmonary tuberculosis (TB) treatment, most patients required treatment for more than 9 months (36.8%), followed by 6–9 months (32.9%) and 0–6 months (30.3%).

The study also found a statistically significant relationship between smoking history and the duration of pulmonary TB treatment among inpatients at Budhi Asih Regional General Hospital. This association was confirmed by a p-value of 0.001 ($p < 0.05$), indicating that smoking behavior is significantly related to the length of TB treatment.

Suggestion

Based on the results of this study, there is a significant relationship between smoking history and the duration of pulmonary tuberculosis (TB) treatment among hospitalized patients. The findings indicate that smoking behavior is associated with longer treatment periods, suggesting that smoking may negatively affect the recovery process and treatment outcomes of TB patients.

The distribution of respondents showed that all participants had a history of smoking, with an equal proportion of light smokers and heavy smokers. Most heavy smokers required treatment for more than nine months, whereas the majority of light smokers completed treatment within nine months. These findings highlight the potential impact of smoking intensity on the length of TB treatment.

In conclusion, smoking behavior is an important factor related to the duration of pulmonary TB treatment. Therefore, smoking cessation programs and health education should be integrated into TB management to improve treatment effectiveness, accelerate recovery, and reduce the risk of prolonged treatment among TB patients.

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