

Determinants of Treatment Delay in Drug-Resistant Tuberculosis Patients

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Abstract. The incidence of drug-resistant (DR) tuberculosis (TB) is increasing worldwide. In Indonesia, DR-TB was 31,000 cases in 2024, also increasing compared to 28,000 cases in 2021. 78.2% of TB patients who were diagnosed with DR-TB experienced treatment delay of up to ten days. In addition, treatment delay in patients with DR-TB can increase risk of disease transmission, development of the disease into extensively DR-TB, and possibility of poor treatment outcomes. The aim of this study was to analyze determinants of treatment delay in DR-TB patients. This cross-sectional study was conducted at Abdoel Moeloek Regional General Hospital in Lampung Province, one of the referral hospitals for DR-TB in the province. The sample included all 20 DR-TB patients recorded in August 2025. Data was collected through interviews using a questionnaire, which then analyzed using chi-square test. The results showed no relationship between age, gender, education, occupation, income, comorbidities, distance, or cost to the hospital and treatment delay in DR-TB patients. However, the results revealed an association between loss to follow-up in previous treatments (p-value: 0.002; odds ratio [OR]: 8.182, 95% CI: 1.277–12.416), visiting to other health facilities after diagnosed as TB-RO (p-value: 0.027; OR: 8.182, 95% CI: 2,0 (1,67 – 2,38) and treatment delay in DR-TB patients. Loss to follow up in previous TB treatment related to low motivation of TB patients to take medical treatment. This not only encourages TB patients to fail in first-line treatment, but it also impacts treatment delay when they are DR-TB patients. Visiting other health facilities rather than DR-TB hospital directly will also prolong treatment delay. In conclusion, a strategy is needed to manage TB patients who are lost to follow-up and visiting other health services to avoid increasing the burden on DR-TB patients.

Keywords: *tuberculosis, drug resistant, treatment delay, determinant*

A. Introduction

Drug-resistant tuberculosis (DR-TB) is a case of TB that is resistant to both first- and second-line anti-TB drugs. In 2022, there were 175,650 global cases of DR-TB, which is an 8.5% increase from 2021 and a 17% increase from 2020. Indonesia is one of ten countries that account for 70% of DR-TB cases. By 2024, Indonesia had 31,000 DR-TB cases, up from 30,000 in 2023 and 28,000 in 2021 (1–4).

Indonesia's DR-TB management follows the programmatic management recommended by the World Health Organization (WHO) (5). DR-TB services are provided in hospitals and health institutions that are designated by the Minister of Health of the Republic of Indonesia to implement DR-TB services (6). DR-TB diagnoses are based on cross-validation of results from rapid molecular testing or other tests. After a RO-TB diagnosis, patients undergo a baseline assessment, including comprehensive physical and psychological examination and multidrug resistance susceptibility testing. This assessment is necessary before starting treatment to prevent side effects from second-line anti-TB drugs and to prepare patients mentally for treatment (5). The time between DR-TB diagnosis and treatment initiation is seven days. If it takes longer than seven days, it is considered as a treatment delay (5).

Despite the above-outlined policies, treatment delays for DR-TB patients still occur. Studies in Uganda, China, and Bangladesh revealed treatment delays of ten, one, and seven days, respectively (7–10). Research at Hasan Sadikin Hospital, Indonesia, showed that in the period of 2015 – 2018, 78.2% of the 9,663 TB RO patients experienced treatment delays (11). Furthermore, treatment delays

for DR-TB patients can increase the risk of disease transmission and progression to extensively drug-resistant TB, as well as the likelihood of poor treatment outcomes (5,7–11).

Several factors contribute to the incidence of TB, including treatment delays in DR-TB patients. Socioeconomic conditions directly influence treatment delays in DR-TB patients and indirectly influence them through access to health services, food security, housing conditions, and behavior (12). Furthermore, these factors vary across countries and regions, as shown by several studies. For example, research in Uganda showed that patients who missed follow-up appointments and visited various health services before seeking DR-TB services contributed to treatment delays (10). Research in China indicates that young age, immigrant status, and lack of supervision contribute to treatment delays in patients with DR-RO (8,9). Research in Indonesia indicates that employment, living out of town, and seeking treatment at private healthcare facilities contribute to treatment delays (11,13,14). Furthermore, DR-RO patients are mostly of low socioeconomic status and often delay treatment due to financial constraints (15,16).

In Lampung Province, DR-TB cases have increased. There were 106 cases in 2022, increasing to 126 and 167 cases in 2023 and 2024, respectively. DR-TB patients in Lampung Province receive treatment at six district/city general hospitals in Bandar Lampung City, Metro City, South Lampung Regency, North Lampung Regency, Tulang Bawang Regency, and Abdoel Moeloek Regional General Hospital in Lampung Province. The number of DR-TB patients at Abdoel Moeloek hospital is higher than the number of DR-TB patients at district/city hospitals providing DR-TB services (17–19).

Referring to the above background, there was limited research have examined the length of treatment delay in DR-TB patients in Lampung Province. Furthermore, risk factors for treatment delay vary across regions and countries. Therefore, this study aims to examine treatment delay length in DR-TB patients at Abdoel Moeloek Regional General Hospital and its determinants.

B. Method

This cross-sectional study was conducted at Abdoel Moeloek Regional General Hospital in Lampung Province. The sample included all 20 DR-TB patients recorded in August 2025. Data was collected through interviews using a questionnaire, which then analyzed using chi-square test. In this research, research variables consist of independent and dependent variables. Dependent variable in this research was treatment delay (number of days getting treatment after diagnosed DR-TB was more than seven days: yes or no). Meanwhile, independent variables in this research include: age (respondent's age <44 years old: yes or no); sex (male or female); education (respondents education >9 years : no or yes); occupation (respondents have occupation in the last one year: no or yes); income (respondent's income less than Lampung Province minimum salary: yes or no); diabetes mellitus/ DM (respondent's DM status: yes or no); HIV/AIDS (respondent's HIV/AIDS status: yes or no); smoking (respondents smoke until now: yes or no); previous treatment (had prior treatment at a non-healthcare DR-TB after being diagnosed DR-TB: yes or no); loss to follow up history in previous TB treatment (yes or no); distance (distance to hospital <5 kilometers: no or yes); cost (cost to reach hospital >IDR 50.000: yes or no).

C. Result and Discussion

This study engaged univariate and bivariate analyses. Univariate analysis was used to describe the variables, and bivariate analysis with chi-square was used to determine the relationship between the independent and dependent variables. The results of these analyses are presented in Tables 1, 2, and 3.

Initial Findings

The results of the univariate analysis in Table 1 show that DR-TB patients at Abdoel Moeloek Regional General Hospital were mostly under 44 years old (55.0%), male (60.0%), highly educated (60.0%), and employed either temporarily or permanently (75.0%). They had an income less than the minimum Lampung Province salary (75.0%), lived more than five kilometers from the hospital (80.0%), spent more than IDR 50,000 to get the hospital (60.0%), and did not have HIV/AIDS (100.0%), DM (70.0%), or other comorbidities (75.0%). They also did not smoke (75.0%), visited

other health services after being diagnosed with DR-TB and referred to Abdoel Moeloek Hospital, and had history of loss to follow up in the previous TB treatment (55.0%). The median treatment delay in this research is one day, ranging from one to three days. The number of days is outside the time required for TB patients after diagnosed as DR-TB and refer to DR-TB health services to comprehensive physical and psychological examination and multidrug resistance susceptibility testing, which need seven days.

Table 1. Univariate Analysis

No	Variable	f	%
1	Age		
	Less than mean (<44 years)	11	55.0
	≥ 44 tahun	9	45.0
2	Sex		
	Male	12	60.0
	Female	8	40.0
3	Education		
	<9 years	8	40.0
	≥9 years	12	60.0
4	Occupation		
	No	5	25.0
	Yes	15	75.0
5	Income		
	< minimum Lampung Province salary	15	75.0
	≥ minimum Lampung Province salary	5	25.0
6	Distance to hospital		
	> 5 km	16	80.0
	≤ 5 km	4	20.0
7	Cost to hospital		
	> IDR 50,000	12	60.0
	≤ IDR 50,000	8	40.0
8	Comorbid DM		
	Yes	6	30.0
	No	14	70.0
9	Comorbid HIV/ AIDS		
	No	20	100.0
10	Other comorbid		
	Yes	6	30.0
	No	14	70.0
11.	Smoking		
	Yes	5	25.0
	No	15	75.0
12.	Visiting non-DR hospital before visiting Abdoel Moeloek hospital		
	Yes	13	65.0
	No	7	35.0
13	Have history of loss to follow up in previous TB treatment		
	Yes	11	55.0
	No	9	45.0
14.	Treatment delay		
	Yes	11	55.0
	No	9	45.0

Source: Processed Research Data, 2025.

Table 2 shows the results of the bivariate analysis of visiting other health services rather than Abdoel Moeloek hospital as DR-TB health services after being diagnosed with DR-TB and treatment delay. Most TB patients who experienced treatment delay (76.9%) visited other health services after being diagnosed and referred to Abdoel Moeloek Regional Hospital. Most TB patients who did not experience treatment delay (85.7%) did not visit other health services after being diagnosed with DR-TB and referred to Abdoel Moeloek Regional Hospital. The Chi-Square analysis revealed a significant relationship between visiting other health services after being diagnosed with DR-TB and referred to Abdoel Moeloek Regional Hospital and treatment delays (p -value = 0.027, smaller than the alpha level of 0.05). The analysis also yielded an odds ratio (OR) value of 2.0 (95% confidence interval [CI] = 1.67 - 2.38), indicating that RO TB patients who visited other health services after diagnosis and referral to Abdoel Moeloek Regional Hospital were twice as likely to experience treatment delays compared to those who went directly to the hospital for treatment.

Table 2. Bivariate Analysis of Visiting Other Health Services after Diagnosed DR-TB and Treatment Delay

Visiting Other Health Services after Diagnosed DR-TB		Treatment delay				p-value	OR (95% CI)
		Yes		No			
		f	%	f	%		
Yes		10	76.9	3	23.1	0.027	2.0 (1.67 – 2.38)
No		1	14.3	6	85.7		

Source: Processed Research Data, 2025.

Bivariate analysis between history of loss to follow up in the previous TB treatment and treatment delay is shown in table 3. The results show that DR-TB patients who experienced treatment delay were more (90.9%) TB patients who had a history of loss to follow up in previous TB treatment. While TB RO patients who did not experience treatment delay were more (88.9%) TB patients who did not have a history of loss to follow up in previous TB treatment. The results of the Chi Square analysis obtained a p value = 0.002 smaller than α = 0.05, so there is a relationship between History of loss to follow up in previous TB treatment and treatment delay. The results of the Chi Square analysis also obtained an OR value = 8.00 (95% CI = 4.29 - 14.88) which means that TB patients who had a history of loss to follow up in previous treatment had an 8 times greater risk of treatment delay compared to TB patients who did not have a history of loss to follow up in previous TB treatment.

Table 3. Bivariate Analysis of Visiting Other Health Services after Diagnosed DR-TB and Treatment Delay

Have history of loss to follow up in the previous TB treatment	Treatment delay				p-value	OR (95% CI)
	Yes		No			
	f	%	f	%		
Yes	10	90.9	1	9.1	0.002	8.00 (4.29 –
No	1	11.1	8	88.9		14.88)

Source: Processed Research Data, 2025.

Analysis and Discussion

In this research, DR-TB treatment was considered delayed if initiation occurred more than seven days. Seven days refer to the time needed for comprehensive physical and psychological examination and multidrug resistance susceptibility testing before DR treatment applied to DR-TB patients (10). Delays were observed in 55% of the patients, while 45% began treatment without delay. The median treatment delay was one day with maximum treatment delay was three days. Furthermore, the median initiation treatment time after diagnosis in this research was eight days. This median time was shorter than the 22.6 reported in a Uganda study (10). This initiation time also shorter than the

initiation time in Ethiopia study (15). Abdoel Moeloek hospital is in Bandar Lampung, capital of Lampung Province. Due to its location in the provincial capital, Abdoel Moeloek Hospital has easy access and is supported by transportation facilities. Furthermore, most of respondents in this study were from Bandar Lampung. This supports the short treatment delay of 1-3 days.

This study shows that history of loss to follow up in previous TB treatment is closely related to treatment delay. Previous research about sputum conversion delay in the first two months of treatment in Bandar Lampung revealed that lack of knowledge of TB treatment cause TB patients did not follow the instructions of TB treatment and resulting the occurrence of sputum conversion delay as well as loss to follow up (20). This condition also encourages treatment delay in DR-TB.

The result of this study shows that visiting other health services beside DR-TB health services will lead to treatment delays. Research in Uganda also found that patients who visited other health services after being diagnosed and referred to TB RO health services had a greater risk of experiencing treatment delays (AOR = 1.22; 95% CI: 1.01–1.47) (10). Visiting a health service other than DR-TB health services will prolong patients' treatment delay. Since the health services upon discovering that the TB patients were DR-TB patients, the health service will refer the patient to a health service for DR-TB.

In this research, age, gender, education, occupation, income, distance to DR-TB health services, costs for accessing DR-TB health services, DM comorbidities, HIV/AIDS comorbidities, other comorbidities, and smoking; were not related to treatment delay. This is because there were no significant differences between the case and control groups according to the variables studied. This could be due to the relatively small sample size in this study.

D. Conclusion

The treatment delay in this research was influenced by history of loss to follow up in previous TB treatment and visiting other health services after diagnosed as DR-TB and refer to DR-TB health services. In addition, monitoring DR-TB patients after diagnosed DR-TB and refer to DR-TB health services should be increase to prevent treatment delay.

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