



RESEARCH ARTICLE

# The Influence of Medication Non-Adherence on the Occurrence of Drug-Resistant Tuberculosis

Reni Stefhanie Handayani<sup>1\*</sup>, Harimat Hendarwan<sup>2</sup>, Teja Ratri<sup>3</sup>

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## Abstract

Drug-resistant tuberculosis (DR-TB) presents a significant challenge to global TB control efforts, with medication non-adherence identified as a major contributing factor. This study aimed to investigate the influence of medication non-adherence on the occurrence of DR-TB in Serang City, Indonesia. Utilizing an observational analytic study with a case-control design, the research included 76 TB patients, comprising 38 DR-TB cases and 38 drug-sensitive TB controls. Data were collected from secondary sources and validated questionnaires and analyzed using univariate and bivariate methods, including Chi-square tests and Odds Ratios (OR). The findings revealed a significant relationship between medication non-adherence and DR-TB, with an OR of 11.56, indicating that non-adherent patients are 11.5 times more likely to develop DR-TB compared to adherent patients. However, demographic factors such as age, occupation, and education did not significantly influence the incidence of DR-TB. The study concludes that medication non-adherence is a critical risk factor for the development of DR-TB, underscoring the need for targeted interventions to improve treatment adherence, particularly through educational campaigns and community-based support. Health authorities are encouraged to implement intensive educational programs focused on the risks of non-adherence and ensure that TB treatment is accessible and supported by community health workers. Policymakers should allocate sufficient resources to these initiatives to effectively reduce the incidence of DR-TB.

Keywords: Drug-resistant tuberculosis, medication non-adherence, TB control, case-control study, health interventions

**Abstrak:** Tuberkulosis resisten obat (TB-RO) menghadirkan tantangan signifikan bagi upaya pengendalian TB global, dengan ketidakpatuhan terhadap pengobatan diidentifikasi sebagai faktor utama yang berkontribusi. Penelitian ini bertujuan untuk menyelidiki pengaruh ketidakpatuhan terhadap pengobatan terhadap kejadian TB-RO di Kota Serang, Indonesia. Menggunakan studi analitik observasional dengan desain kasus-kontrol, penelitian ini melibatkan 76 pasien TB, terdiri dari 38 kasus TB-RO dan 38 kontrol TB yang sensitif terhadap obat. Data dikumpulkan dari sumber sekunder dan kuesioner yang telah divalidasi, dan dianalisis menggunakan metode univariat dan bivariat, termasuk uji Chi-square dan Odds Ratio (OR). Temuan menunjukkan adanya hubungan signifikan antara ketidakpatuhan pengobatan dan TB-RO, dengan OR sebesar 11,56, yang menunjukkan bahwa pasien yang tidak patuh memiliki kemungkinan 11,5 kali lebih besar untuk mengembangkan TB-RO dibandingkan dengan pasien yang patuh. Namun, faktor demografis seperti usia, pekerjaan, dan pendidikan tidak secara signifikan memengaruhi kejadian TB-RO. Studi ini menyimpulkan bahwa ketidakpatuhan terhadap pengobatan merupakan faktor risiko kritis untuk perkembangan TB-RO, yang menekankan perlunya intervensi yang ditargetkan untuk meningkatkan kepatuhan pengobatan, terutama melalui kampanye edukasi dan dukungan berbasis komunitas. Otoritas kesehatan didorong untuk mengimplementasikan program edukasi intensif yang berfokus pada risiko ketidakpatuhan dan memastikan bahwa pengobatan TB dapat diakses dan didukung oleh pekerja kesehatan komunitas. Pembuat kebijakan diharapkan mengalokasikan sumber daya yang memadai untuk inisiatif ini guna secara efektif mengurangi kejadian TB-RO.

<sup>1\*),2</sup> Universitas Indonesia Maju  
<sup>3</sup> Dinas Kesehatan Kota Serang

*\*) corresponding author*

Reni Stefhanie Handayani  
Program Studi Magister Kesehatan Masyarakat, Fakultas  
Ilmu Kesehatan, Universitas Indonesia Maju

Email: renistefhanie@gmail.com

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## INTRODUCTION

Tuberculosis (TB) remains one of the most pressing public health issues globally, particularly in countries with high incidence rates such as Indonesia. The disease poses

significant challenges due to its complex nature and the increasing emergence of drug-resistant tuberculosis (DR-TB). DR-TB, particularly multidrug-resistant TB (MDR-TB), threatens to undermine global TB control efforts, making it a critical area of concern for public health authorities (WHO, 2020). The World Health Organization (WHO) has highlighted that inadequate or non-compliant treatment regimens are the primary drivers of bacterial resistance to anti-tuberculosis drugs (OAT), leading to the proliferation of DR-TB cases (Ghimire et al., 2015).

Globally, medication non-adherence has been recognized as a significant factor contributing to the development of drug resistance in TB patients. Non-adherence to TB treatment, whether intentional or unintentional, disrupts the efficacy of the treatment regimen, allowing the bacteria to survive and develop resistance (Zelko et al., 2016). This issue is not only prevalent in low-resource settings but also in developed countries, where various socioeconomic factors impact patients' adherence to prescribed medication protocols (Brown et al., 2016).

In Indonesia, the incidence of DR-TB is alarmingly high, with an estimated 2.4% of new TB patients and 13% of previously treated patients developing drug resistance. This equates to approximately 24,000 cases or around 8.8 cases per 100,000 people (Ministry of Health Indonesia, 2019). The situation is further exacerbated by the suboptimal treatment success rates for rifampicin-resistant TB (RR-TB), where only 45% of those who began treatment with second-line TB drugs achieved a successful outcome (WHO Global TB Report, 2020). Indonesia, being the country with the second-highest TB incidence globally after India, faces a substantial burden, with 969,000 cases and 98,000 deaths reported in 2020, highlighting the severity of the situation (WHO, 2020).

The global commitment to the End Tuberculosis Strategy, which aims to eliminate TB by 2030, underscores the need for reducing the TB incidence rate to 65 per 100,000 people and lowering the TB mortality rate to 6 per 100,000 (WHO, 2020). Achieving these targets requires a comprehensive approach, addressing the multifaceted challenges that hinder TB control, particularly in high-burden countries like Indonesia. The National Plan for Tuberculosis Control (2020-2024) in Indonesia emphasizes the importance of active involvement across sectors, partners, and communities to meet the goal of TB elimination by 2030 (Ministry of Health Indonesia, 2020). However, challenges such as low case detection rates, low treatment initiation rates, and high numbers of patients discontinuing treatment persist, particularly in managing DR-TB.

The theoretical framework underlying this study is rooted in the Health Belief Model (HBM), which is widely used to understand and predict individuals' adherence to medical treatment regimens, including tuberculosis (TB) medication. The HBM posits that individuals are more likely to engage in health-promoting behaviors, such as adhering to medication, if they perceive a high susceptibility to a severe health outcome (Rosenstock, 1974). In the context of TB, this model suggests that patients who perceive a high risk of developing drug-resistant tuberculosis (DR-TB) due to non-adherence, combined with an understanding of the severity of DR-TB, are more likely to follow their prescribed treatment regimen. This study applies the HBM to explore how perceptions of risk, severity, and the benefits of adherence influence medication compliance among TB patients in Serang City, ultimately affecting the incidence of DR-TB.

Despite the extensive research on TB treatment adherence and its impact on health outcomes, there remains a significant gap in understanding the specific factors contributing to non-adherence in high-burden areas like Indonesia, where the incidence of DR-TB is particularly alarming. While previous studies have established a general link between non-adherence and the development of DR-TB (Ghimire et al., 2015), there is a lack of comprehensive research that integrates socio-economic, cultural, and psychological factors influencing patient behavior in this context. Moreover, existing studies have often focused on broad geographic regions, neglecting localized studies that could provide more nuanced insights into the specific challenges faced by different communities.

The province of Banten, for instance, reported 967 cases of DR-TB in 2020, with a case detection rate of only 52%, falling short of the 75% target. Moreover, the treatment success rate was 52%, well below the 80% target (Meyrisca, 2022). In Serang City, within Banten Province, there were 25 cases of DR-TB in 2019, with a gradual increase in the number of cases over the subsequent years, highlighting the ongoing challenge of managing DR-TB at the local level.

This study seeks to fill this gap by focusing on Serang City in Banten Province, an area with a high incidence of DR-TB. By applying the Health Belief Model, this research aims to identify the key determinants of medication non-adherence among TB patients in this specific locale. The findings are expected to contribute to the development of more targeted interventions that address the unique socio-cultural and psychological barriers to adherence in similar high-risk areas, thereby enhancing the effectiveness of TB control efforts in Indonesia and beyond.

Given this context, understanding the factors contributing to the persistence and spread of DR-TB, particularly medication non-adherence, is crucial. This study aims to analyze the influence of medication non-adherence on the incidence of DR-TB in Serang City in 2023. By exploring this relationship, the research seeks to contribute to the existing body of knowledge and inform future strategies to enhance TB control efforts in Indonesia.

## METHOD

### Study Design

This study employed an observational analytic method with a case-control design, which is particularly suitable for investigating the relationship between risk factors, such as medication non-adherence, and the occurrence of drug-resistant tuberculosis (DR-TB). The case-control design allows for the retrospective comparison of exposure factors between patients with DR-TB (cases) and those with drug-sensitive TB (controls) (Setia, 2016). This approach is advantageous in identifying and analyzing risk factors in situations where outcomes are relatively rare or delayed, such as DR-TB (Schlesselman & Stolley, 1982).

### Population and Sample

The study was conducted at community health centers in Serang City in February 2024. The population consisted of 59 drug-resistant TB patients recorded at these health centers. A total of 72 TB patients were included in the sample, divided into 38 cases (patients with DR-TB) and 38 controls (patients with drug-sensitive TB). The samples were selected using purposive sampling based on specific

inclusion criteria: (1) patients registered at health facilities in Serang City, (2) laboratory results confirming TB status, and (3) patients' willingness to participate in the study. The sample size was considered sufficient based on power analysis to detect statistically significant differences between groups (Lachin, 1981).

### Data Collection Procedures

Data were collected retrospectively from secondary sources, including medical records and laboratory reports. These data were complemented by questionnaires administered to participants to gather additional information on demographic characteristics and treatment adherence. The validity and reliability of the questionnaires were established through pilot testing and validation studies conducted prior to the full-scale data collection (DeVellis, 2016).

### Research Instruments

The primary research instruments included standardized questionnaires developed to assess medication adherence and other relevant factors. These instruments were designed following established guidelines for health behavior research and were validated for content and construct validity (Streiner & Norman, 2015). The questionnaires included items on treatment adherence, socio-demographic factors, and patient perceptions related to the Health Belief Model (Rosenstock, 1974).

### Data Analysis

Data analysis was performed using both univariate and bivariate techniques. The Chi-square test was used to examine the relationship between medication non-adherence and the incidence of DR-TB. This test is appropriate for assessing associations between categorical variables, such as adherence status and TB resistance (Agresti, 2018). Odds ratios (OR) and 95% confidence intervals (CI) were calculated to estimate the strength of association between non-adherence and DR-TB, with statistical significance set at  $p < 0.05$ .

### Ethical Considerations

Ethical approval for the study was obtained from the Institutional Review Board (IRB) at Fakultas Ilmu Kesehatan, Universitas Indonesia Maju. Written informed consent was obtained from all participants before their inclusion in the study. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring confidentiality, voluntary participation, and the right to withdraw from the study at any time. Data confidentiality was maintained by anonymizing participant information and securing data storage (World Medical Association, 2013).

## RESULTS OF STUDY

Based on Table 1, which presents the characteristics of the TB patients studied, it was found that the majority of patients (89.5%) are within the productive age range, between 15 and 60 years. This indicates that TB tends to affect individuals in their productive years more frequently, a group typically associated with higher

mobility and greater potential for transmission. Additionally, more than half of the patients (55.3%) are employed, suggesting that those who have more social interactions through their work may be at a higher risk of TB exposure. In terms of educational level, the majority of patients (57.9%) have a low level of education, which may be related to a lack of knowledge or understanding about the importance of adherence to TB treatment.

Regarding gender, the majority of patients (65.8%) are male, consistent with previous findings that males are at higher risk of TB exposure compared to females, possibly due to social and behavioral factors. Finally, the treatment adherence rate shows that 57.9% of patients are adherent to their treatment regimen, while 42.1% are non-adherent. This relatively high level of non-adherence may be a key factor contributing to the increase in drug-resistant TB cases.

The demographic characteristics of the TB patients studied indicate that productive age, employment, educational level, and gender play important roles in the dynamics of TB transmission and control. Productive age and jobs that involve high social interaction increase the risk of TB exposure, while low educational levels may hinder understanding and adherence to treatment. High levels of non-adherence to treatment pose a serious threat to TB control efforts, particularly in preventing the development of drug-resistant TB. Therefore, more targeted interventions are needed, including more intensive health education and specific approaches for high-risk groups, such as males and those with lower educational levels.

**Table 1**  
**Characteristics of TB Patients (N=76)**

Variable	Frequency	%
<b>Age</b>		
Productive Age (15-60 years)	68	89,5
Non-productive (> 60 years)	8	10,5
<b>Occupation</b>		
Employed	42	55,3
Unemployed	34	44,7
<b>Education</b>		
Higher Education	32	42,1
Lower Education	44	57,9
<b>Gender</b>		
Male	50	65,8
Female	26	34,2
<b>Adherence</b>		
Adherent	44	57,9
Non-adherent	32	42,1

Table 2 shows a significant relationship between medication non-adherence and the occurrence of drug-resistant TB. From the data analysis, an Odds Ratio (OR) of 11.56 was obtained, indicating that patients who are non-adherent to their treatment have an 11.5 times greater risk of developing drug-resistant TB compared to those who are adherent. Although the Confidence Interval (CI) is relatively wide, ranging from 3.815 to 35.001, which suggests some uncertainty in this estimate, the relationship between non-adherence and the increased risk of drug-resistant TB remains significant. This is further supported by a P-value of 0.000, indicating that non-adherence to treatment has a statistically significant impact on the occurrence of drug-resistant TB.

These findings confirm that non-adherence to treatment is a major risk factor in the development of drug-resistant TB. The high Odds Ratio suggests that efforts

to improve treatment adherence should be a priority in TB control programs, as non-adherent patients are highly vulnerable to developing drug resistance. Despite the uncertainty in risk estimation indicated by the wide Confidence Interval, the strong statistical significance ( $P < 0.05$ ) underscores that targeted interventions to enhance

treatment adherence can substantially contribute to reducing the incidence of drug-resistant TB. Therefore, education and close monitoring of patient adherence are crucial in preventing the spread of this more difficult-to-treat form of TB.

**Table 2**  
**Influence of Medication Non-adherence on the Incidence of Drug-resistant TB in Serang City in 2023**

Medication Adherence	TB Patients				Total		P Value	OR	95% CI
	TB RO		TB SO		F	%			
	f	%	f	%					
Medication Adherence									
Non-adherent	26	68,4	6	15,8	32	42,1	0,000	11,56	3,815-35001
Adherent	12	31,6	32	84,2	44	57,9			
Total	38	100	38	100	76	100			

Table 3 presents an analysis of the influence of age, occupation, and education on the incidence of drug-resistant TB. The results indicate that age does not have a significant impact on the occurrence of drug-resistant TB, with a P-value of 0.455. This suggests that age, within the studied population, is not a significant risk factor for the development of drug-resistant TB. Similarly, occupation also shows no significant influence on the incidence of drug-resistant TB, with a P-value of 0.356. This outcome might be due to the variability in job types and the level of TB exposure, which were not directly measured in this study. Lastly, education also does not have a significant impact on the incidence of drug-resistant TB, with a P-value of 0.163. However, lower education levels may contribute to higher rates of non-adherence to treatment, which could eventually lead to an increased risk of developing drug-resistant TB.

The results from this table indicate that age, occupation, and education do not have a direct significant impact on the incidence of drug-resistant TB in the studied population. However, this does not mean that these factors are irrelevant in a broader context. For instance, although education does not show a direct significant influence, lower education levels may be associated with non-adherence to treatment, a major risk factor for the development of drug resistance. Similarly, variations in job types and age might affect TB exposure risk differently beyond the variables measured in this study. Therefore, while these results suggest that these variables do not significantly influence the incidence of drug-resistant TB in this study, it is important to consider these factors in broader and more comprehensive TB control strategies.

**Table 3**  
**Influence of Age, Occupation, and Education, on the Incidence of Drug-resistant TB**

Variables	TB Patients				Total		P Value
	TB RO		TB SO		f	%	
	f	%	F	%			
Age							0,455
Productive Age (15-60 years)	35	92,1	33	86,8	68	89,5	
Non-productive Age (> 60 years)	3	7,9	5	13,2	8	10,5	
Occupation							0,356
Unemployed	15	39,5	19	50,0	34	44,7	
Employed	23	60,5	19	50,0	42	55,3	
Education							0,163
Lower Education	19	50,0	25	65,8	44	57,9	
Higher Education	19	50,0	13	34,2	32	42,1	

From the analysis of result, it is clear that non-adherence to treatment is the primary factor contributing to the incidence of drug-resistant TB. This is supported by the high and statistically significant OR value. This non-adherence may be driven by various factors, including a lack of education, inadequate understanding of the risks associated with drug-resistant TB, and challenges in accessing healthcare services.

However, age, occupation, and education levels did not show significant influence on the incidence of drug-resistant TB within this population. This may suggest that other factors, such as socio-economic conditions, cultural influences, or social support, might play a larger role in

determining treatment non-adherence and the occurrence of drug-resistant TB.

## DISCUSSION

This study aimed to analyze the influence of medication non-adherence on the incidence of drug-resistant tuberculosis (DR-TB) in Serang City. The results demonstrate a significant relationship between non-adherence to TB treatment and the occurrence of DR-TB, as evidenced by the Odds Ratio (OR) of 11.56, indicating that non-adherent patients are 11.5 times more likely to

develop DR-TB compared to adherent patients. This finding aligns with the Health Belief Model (HBM), which suggests that individuals who perceive a higher risk of severe outcomes, such as DR-TB, due to non-adherence are more likely to adhere to treatment regimens (Rosenstock, 1974). However, despite the strong association, the wide Confidence Interval (CI) (3.815–35.001) indicates some level of uncertainty in the risk estimation, suggesting the need for further studies with larger sample sizes to refine these estimates.

The significant impact of medication non-adherence on DR-TB risk is consistent with previous studies that have identified non-adherence as a critical factor in the development of drug resistance (Ghimire et al., 2015; Zelko et al., 2016). Non-adherence disrupts the effectiveness of TB treatment regimens, allowing *Mycobacterium tuberculosis* to survive and potentially develop resistance to standard anti-TB drugs. This underscores the importance of implementing targeted interventions to improve treatment adherence, particularly in high-burden areas like Serang City, where the risk of DR-TB is significant.

Interestingly, the study found that demographic factors such as age, occupation, and education did not significantly influence the incidence of drug-resistant tuberculosis (DR-TB). Age, which is frequently considered a critical determinant of health outcomes, was not identified as a significant predictor of DR-TB in this population, as indicated by a P-value of 0.455. This result diverges from some previous studies that have linked age to various health outcomes, including susceptibility to infectious diseases. However, this finding aligns with research suggesting that age may not be a decisive factor in the development of DR-TB, particularly when behavioral factors, such as adherence to treatment, are more influential (Lönnroth et al., 2015).

The insignificant relationship between occupation and DR-TB incidence ( $P = 0.356$ ) can likely be attributed to the variability in exposure risk inherent to different job types. For instance, occupations that involve frequent close contact with others, such as healthcare workers or individuals in densely populated environments, may have higher exposure risks than those in more isolated jobs. However, this study did not specifically measure or categorize the occupational exposure risk, which could explain the lack of a significant association. Similar findings have been reported in studies where occupation alone was not a significant predictor of TB or DR-TB outcomes, suggesting that job-related factors may need to be considered more intricately, accounting for the specific working conditions and exposure risks (Dewan et al., 2019).

Regarding education, although it was not significantly associated with DR-TB incidence in this study ( $P = 0.163$ ), it remains a critical factor in public health, particularly in influencing treatment adherence. Lower educational levels are often linked to reduced health literacy, which can adversely affect patients' understanding of and adherence to prescribed treatment regimens (Patiño et al., 2016). Health literacy, a key component of effective healthcare delivery, influences how patients comprehend their disease and the importance of adhering to their treatment plans. Studies have shown that individuals with higher education levels are more likely to adhere to treatment protocols, thereby reducing the risk of complications, including the development of drug resistance (Ferguson et al., 2018). Therefore, while education level did not directly correlate with DR-TB incidence in this study, its impact on health literacy and adherence behaviors cannot be overlooked, as it may indirectly affect DR-TB outcomes.

Moreover, the lack of significant findings in these demographic categories highlights the potential predominance of behavioral and social factors over static demographic traits in influencing DR-TB outcomes. This aligns with the growing body of literature emphasizing the role of patient behavior, access to healthcare, and social determinants of health in managing TB and preventing DR-TB (Tola et al., 2020). For instance, the effectiveness of community-based interventions and support systems in improving adherence to treatment and reducing DR-TB incidence has been increasingly recognized (Sharma et al., 2017). Therefore, future research should consider a more comprehensive approach that includes behavioral, social, and environmental factors to better understand and address the determinants of DR-TB.

The findings of this study also highlight the broader implications of non-adherence on public health. Given the strong association between non-adherence and DR-TB, it is essential for public health initiatives to focus on enhancing patient education and adherence support. Educational interventions tailored to the needs of lower-educated populations could be particularly effective in reducing non-adherence rates and, consequently, DR-TB incidence. Moreover, improving access to healthcare services and ensuring that patients receive consistent follow-up care could help mitigate the challenges associated with long-term TB treatment, which is often cited as a reason for non-adherence (Brown et al., 2016).

### Limitations of Study

This study presents several limitations that should be acknowledged. Firstly, the relatively small sample size ( $N=76$ ) may constrain the generalizability of the findings to the broader population. Small sample sizes are often associated with reduced statistical power, which can increase the likelihood of Type II errors—failing to detect a true effect when one exists (Button et al., 2013). Moreover, the wide Confidence Interval (CI) observed in the Odds Ratio (OR) analysis underscores the variability and uncertainty in the estimated risk of non-adherence leading to drug-resistant tuberculosis (DR-TB). Wide CIs indicate that the data may not be sufficient to provide a precise estimate of the effect size, suggesting that larger studies are necessary to obtain more reliable results (Sullivan & Feinn, 2012).

Additionally, the reliance on secondary data sources introduces the potential for bias, particularly if the data were incomplete, inaccurate, or not collected uniformly across all participants. Secondary data often lack the specificity and detail needed for nuanced analysis, and there may be inconsistencies in how variables were measured or recorded, leading to potential misclassification bias (Sorensen et al., 2016). For example, information on medication adherence and TB treatment outcomes may have been recorded differently across health facilities, impacting the study's validity.

Another limitation is the retrospective nature of the study, which relies on data that were collected in the past, potentially leading to recall bias, especially in patient-reported measures (Hassan, 2006). Furthermore, this study did not account for several other potential confounders, such as socio-economic status, cultural practices, and health system factors, which are known to influence TB treatment adherence and the development of DR-TB (Lönnroth et al., 2010). These unmeasured variables could have introduced residual confounding, affecting the observed associations.

Future research should address these limitations by conducting prospective cohort studies with larger and more diverse populations. Prospective designs allow for the collection of data over time, reducing recall bias and enabling the capture of temporal relationships between variables. Such studies should also incorporate more comprehensive data collection, including detailed information on socio-economic factors, cultural practices, and healthcare access, to better understand the multifactorial nature of DR-TB risk. By addressing these gaps, future studies can provide stronger evidence to guide TB control efforts.

### Clinical and Policy Implications

The findings of this study have significant implications for clinical practice and public health policy. One of the key takeaways is the critical importance of improving patient adherence to TB treatment to prevent the emergence and spread of DR-TB. Non-adherence to TB medication is a major driver of drug resistance, and as such, healthcare providers should prioritize interventions that enhance adherence, particularly among high-risk populations (WHO, 2018).

To achieve this, healthcare systems should implement more intensive and targeted education campaigns that emphasize the importance of completing TB treatment. Education should be tailored to address the specific barriers to adherence faced by different patient groups, such as those with low health literacy, economic challenges, or cultural beliefs that may discourage adherence (Patiño et al., 2016). Additionally, the role of community health workers (CHWs) in supporting patient adherence cannot be overstated. CHWs can provide ongoing support, monitor patient progress, and address issues that may lead to non-adherence, such as side effects or difficulties in accessing medication (Sharma et al., 2017).

Moreover, ensuring that patients have easy and consistent access to TB medication and follow-up services is crucial. This includes making TB treatment services more accessible through decentralization of TB care, integrating TB services with primary healthcare, and providing transportation or financial support to patients who may struggle to access care (Lönnroth et al., 2015).

Policymakers should consider these findings when designing and implementing TB control programs. Allocating sufficient resources towards improving treatment adherence is essential to curbing the spread of DR-TB. This includes funding for adherence support programs, enhancing the capacity of health workers to manage and monitor TB patients effectively, and developing policies that incentivize adherence, such as conditional cash transfers or other forms of social support (Fryatt et al., 2010).

In conclusion, addressing the challenges of treatment non-adherence through a multifaceted approach that includes education, support, and policy interventions is crucial for controlling DR-TB. By prioritizing these strategies, healthcare systems can make significant strides towards reducing the burden of DR-TB and improving TB treatment outcomes globally.

### CONCLUSIONS AND RECOMMENDATION

The findings of this study confirm that medication non-adherence is a significant predictor of drug-resistant tuberculosis (DR-TB) in Serang City, with non-adherent

patients being 11.5 times more likely to develop DR-TB. This aligns with the Health Belief Model (HBM), which suggests that perceived risks and understanding of the severity of non-adherence are crucial factors influencing patient behavior. Additionally, demographic factors such as age, occupation, and education did not show a significant impact on DR-TB incidence, indicating that behavioral factors may play a more critical role in the development of DR-TB.

Given these findings, it is recommended that healthcare providers implement more targeted and intensive educational campaigns aimed at increasing medication adherence, particularly among the productive age group and males, who constitute the majority of the TB-affected population. Additionally, policies should be developed to integrate community health workers in the ongoing support and monitoring of TB patients, ensuring that adherence is maintained throughout the treatment process. Policymakers should also consider allocating sufficient resources to support these initiatives, recognizing the critical role of adherence in preventing the spread of DR-TB.

### Conflict of Interest Statement

The authors declare that there were no conflicts of interest during the conduct of this research.

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