



The Role of Knowledge and Motivation in Multidrug-Resistant Tuberculosis (MDR-TB) Incidence

Aan Sutandi¹, Martika Hijriani², Apriana Rahmawati^{3*}, Harizza Pertiwi⁴

^{1,2,3,4} Nursing Study Program, Faculty of Nursing and Midwifery, Universitas Binawan, East Jakarta, Indonesia

anaapriana.ar@gmail.com

Abstract. Multidrug-resistant tuberculosis (MDR-TB) is defined as tuberculosis caused by *Mycobacterium tuberculosis* strains resistant to at least isoniazid (INH) and rifampicin (RMP), confirmed through drug sensitivity testing or rapid molecular diagnostics (e.g., GeneXpert). Due to this resistance to first-line anti-tuberculosis medications, MDR-TB necessitates prolonged treatment with second-line drugs. This study aimed to analyze risk factors associated with MDR-TB incidence at a hospital in Bogor, Indonesia. A descriptive-analytical correlational study design with a cross-sectional approach was employed. Participants included 140 purposively sampled MDR-TB patients undergoing treatment for less than 24 months, confirmed by rapid molecular test results. Bivariate analysis using the chi-square test (significance threshold $p < 0.05$) revealed significant associations between MDR-TB incidence and patient knowledge about the disease ($p = 0.044$) as well as patient motivation ($p = 0.047$). These findings underscore the need for healthcare providers managing tuberculosis cases to integrate systematic knowledge assessments at initial diagnosis and continuous motivational support during treatment. Such strategies may reduce the likelihood of drug resistance development.

Keywords: Drug Resistant Tuberculosis, Knowledge, Motivation.

1 Introduction

Drug-resistant tuberculosis (DR-TB) remains a critical global health challenge, characterized by elevated morbidity and mortality, prolonged symptom persistence, increased treatment costs, and greater clinical complexity. The World Health Organization (WHO) categorizes DR-TB into five distinct classifications: (1) isoniazid-resistant TB (Hr-TB), (2) rifampicin-resistant TB (RR-TB), (3) multidrug-resistant TB (MDR-TB), defined as resistance to both isoniazid and rifampicin, (4) pre-extensively drug-resistant TB (pre-XDR-TB), referring to fluoroquinolone-resistant MDR-TB, and (5) extensively drug-resistant TB (XDR-TB), which encompasses rifampicin-resistant TB with

additional resistance to fluoroquinolones, at least one Group A drug (e.g., bedaquiline or linezolid), and one second-line injectable agent [1].

The development of active drug-resistant tuberculosis (DR-TB) is driven by two primary mechanisms: acquired resistance and primary resistance. Acquired resistance arises from inadequate, fragmented, or suboptimal treatment regimens that enable the selection of drug-resistant mutant strains. In contrast, primary (or initial) resistance occurs when an individual is directly infected with a drug-resistant *Mycobacterium tuberculosis* strain. While extensively drug-resistant TB (XDR-TB) is less prevalent among new TB cases compared to retreatment cases, the absolute number of primary drug-resistant infections in untreated populations may still exceed that of retreatment cohorts. Consequently, certain countries report higher rates of DR-TB in treatment-naïve individuals than in previously treated patients [2].

Most tuberculosis (TB) control programs prioritize clinical management over addressing community knowledge and perceptions. However, evidence indicates that effective TB prevention requires community level interventions to improve health literacy and behavioral practices [3]. Persistent gaps in understanding TB transmission mechanisms, preventive strategies, and treatment protocols frequently perpetuate misconceptions, stigma, and fear, ultimately delaying care seeking behaviors and undermining treatment adherence [4]. TB control initiatives hold strategic importance in public health systems by advancing Sustainable Development Goals (SDGs), particularly through workforce development and reductions in TB related morbidity and mortality. These programs aim to optimize therapeutic outcomes by fostering motivation via improvements in environmental quality (extrinsic factors) and strengthening patients' intrinsic drive for recovery. Successful implementation is evidenced by enhanced life expectancy, diminished disease burden, and improved population health—key contributors to sustainable, high quality development [5].

2 Method

This study employed a quantitative descriptive cross sectional design to identify risk factors—specifically, knowledge and motivation—associated with multidrug resistant tuberculosis (MDR-TB) incidence. The population comprised all drug resistant tuberculosis outpatients at Goenawan Pulmonary Hospital, Bogor, diagnosed between November 2022 and January 2023. A total of 189 individuals meeting inclusion criteria (treatment-seeking patients with medical records, confirmed MDR-TB via molecular rapid test examinations, undergoing treatment for less than 24 months, communicative, and consenting to participate) were initially identified. Using the Slovin formula for sample size determination, 140 respondents were selected for analysis.

This research instrument used a modified questionnaire divided into three parts: a questionnaire for patient knowledge, patient motivation, and MDR TB incidence. For

patient knowledge, the research instrument was modified from Prabowo (2020) and consisted of five questions. Each correct answer was scored as 1, and incorrect answers as 0. Responses were classified into two categories: sufficient knowledge (≥ 3 correct answers) and insufficient knowledge (≤ 2 correct answers). The motivation questionnaire, adopted from Wahyuningsih (2020), included six questions using a Likert scale. Total scores were categorized as high motivation (15–24) or low motivation (6–14). MDR TB incidence data were obtained from medical records over a three-month period. All instruments were validated for reliability and suitability in this study.

The analysis was conducted using IBM SPSS 27 software with the chi square test at a significance level of $\alpha = 0.005$. A p value < 0.05 indicated a statistically significant relationship between variables. This study involved human subjects and received ethical approval from the University of Binawan. Ethical principles were upheld, ensuring the research purpose aligned with ethical standards and respondent rights were protected. Ethical feasibility was confirmed by the Health Research Ethics Committee, Faculty of Nursing and Midwifery, Binawan University (Approval Code: No. 087/PE/FKK-KEPK/XI/2023).

3 Result

Table 1 presents the distribution of respondent characteristics related to knowledge, motivation, and multidrug resistant tuberculosis (MDR TB) incidence. Among 140 respondents, the majority (111 respondents, 79.3%) demonstrated insufficient knowledge about MDR TB. Similarly, motivation levels were predominantly low, with 111 respondents (79.3%) in this category. Regarding drug resistance incidence, 94 respondents (67.1%) experienced resistance, confirmed by treatment relapse during therapy.

Table 1. Patient characteristics related to MDR TB

Characteristic	n	Percentage (%)
Knowledge		
Sufficient	29	20,7%
Insufficient	111	79,3%
Total	140	100%
Motivation		
High	29	20,7%
Less	111	79,3%
Total	140	100%
Incidence of MDR-TB		
Yes	94	67,1%
No	46	32,9%
Total	140	100%

Table 2 illustrates the cross tabulation between knowledge and multidrug resistant tuberculosis (MDR TB) incidence. Among respondents with insufficient

knowledge, 70 (50.0%) developed MDR TB, whereas 41 respondents with sufficient knowledge (29.3%) did not. Chi square analysis revealed a statistically significant association between patient knowledge and MDR TB incidence ($p = 0.044$). The odds ratio (OR) of 2.811 (95% CI: 0.996 to 7.936) indicates that individuals with insufficient TB-related knowledge had 2.811 times higher odds of developing MDR TB compared to those with sufficient knowledge.

Among respondents with low motivation, 79 (56.4%) experienced multidrug resistant tuberculosis (MDR TB), while 32 (22.9%) with low motivation did not. Chi square analysis indicated a statistically significant association between motivation and MDR TB incidence ($p = 0.047$). The odds ratio (OR) of 0.434 (95% CI: 0.188 to 1.001) suggests that individuals with low motivation had 0.434 times lower odds of avoiding MDR TB compared to those with high motivation.

Table 2. Characteristics of Patients Related to MDR TB Incidence

Characteristic	Incidence of MDR-TB				Total		P	OR
	No	%	Yes	%	Total	%		CI (95%)
Knowledge								
Sufficient	24	17,1	5	3,6	29	20,7	0,044	2,811
Insufficient	70	50	41	29,3	111	79,3		(0,996-7,936)
Motivation								
High	15	10,7	14	10,0	29	20,7	0,047	0,434
Low	79	56,4	32	22,9	111	79,3		(0,188-1,001)

4 Discussion

Observational and analytical findings revealed that a majority of respondents possessed limited knowledge about drug-resistant tuberculosis (TB). Statistical analysis demonstrated correlations between patient knowledge, motivation, and multidrug-resistant TB (MDR TB) incidence. These results align with Yuni's (2016) study, which identified a significant association (corrected $p = 0.039$) between patient knowledge and treatment adherence in TB patients through chi-square analysis. Furthermore, the relative risk (RR) value of 1.641 suggests that nonadherent patients were 1.164 times more likely to exhibit low knowledge compared to adherent individuals [6].

Knowledge and understanding critically influence health behaviors by enabling individuals to adapt to their condition, prevent complications, and adhere to treatment regimens. Higher levels of tuberculosis (TB) knowledge are thus associated with improved adherence to TB medication protocols. These findings align with prior research demonstrating a significant correlation between knowledge and treatment adherence

among pulmonary TB patients in the Gamping II Health Center's service area ($p = 0.009$) [7].

Knowledge level critically determines an individual's commitment to health-related actions by directly and indirectly shaping behavior through awareness, guideline adherence, and motivation. Sociodemographic factors such as age, education, occupation, and environmental context influence knowledge acquisition, which subsequently affects adherence consistency to medication regimens [8].

Patients' unfamiliarity with tuberculosis and its therapeutic regimens often leads to poor understanding of treatment protocols, resulting in noncompliant medication-taking behaviors [9]. Qurrotu'ain's (2023) research highlights that knowledge levels significantly predict long-term treatment adherence, as informed patients demonstrate greater medication regularity. The study further identified that patients with poor knowledge frequently delayed treatment initiation by over two months, initially dismissing their cough as benign. Nonadherence was also observed in respondents who discontinued prescribed regimens for 6–24 months, experienced relapses, failed Category 1 TB treatment, or lacked clarity on treatment outcomes [10].

The odds ratio (OR) for patient motivation was 0.434 (95% CI: 0.188 to 1.001), indicating that low motivation is associated with 0.434 times lower odds of multidrug-resistant tuberculosis (MDR TB) incidence. This identifies motivation as a risk factor for MDR TB occurrence at Goenawan Pulmonary Hospital, Bogor. Motivation, defined as the psychological drive underlying behavior, arises from the interaction of attitudes, needs, perceptions, and decision-making processes [11]. Most respondents exhibited low motivation, consistent with Aristiana & Wartono's (2018) findings linking low motivation to MDR TB incidence (chi-square $p < 0.001$, OR = 47.5). Their study concluded that patients with low motivation faced 47.5 times higher odds of developing MDR TB compared to highly motivated individuals [12].

Among the 29 respondents with high motivation, 15 relapsed or developed multidrug-resistant tuberculosis (MDR TB). Observational data revealed that prolonged TB treatment duration demotivated some respondents, leading to incomplete therapy. Several respondents discontinued medication upon symptom resolution, falsely assuming they were cured. These findings align with Wahyuni & Cahyati's (2020) study, where 42.4% of MDR TB patients exhibited low treatment motivation, demonstrating a significant association between motivation and MDR TB incidence ($p = 0.013$; OR = 5.342). This indicates that individuals with low motivation faced 5.342 times higher odds of developing MDR TB compared to highly motivated counterparts [13].

This study has limitations beyond its findings. The data collection focused solely on identifying treatment delays impacting recovery, without categorizing drug resistance according to the five recognized types—a critical area for future research. Additionally, environmental factors influencing patient recovery were not investigated.

5 Conclusion and Suggestion

In conclusion, knowledge and motivation are significantly associated with tuberculosis drug resistance incidence. A majority of patients with drug-resistant TB exhibited insufficient knowledge and low motivation. Healthcare providers should deliver structured education initiatives to enhance patient understanding of multidrug resistant tuberculosis (MDR TB), emphasizing its adverse health impacts. Improved knowledge may foster patient motivation to seek timely diagnostic and therapeutic services, thereby mitigating resistance risks.

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