

## PREDICTORS OF MEDICATION ADHERENCE AMONG MULTIDRUG-RESISTANT TUBERCULOSIS PATIENTS IN WEST KALIMANTAN: A CROSS-SECTIONAL STUDY

Nita Arisanti Yulanda<sup>1,3</sup>, Tintin Sukartini<sup>2</sup>,  
Andri Setiya Wahyudi<sup>2</sup>, Titan Ligita<sup>3</sup>,  
Nurjihan Dhiyaa Shidqii<sup>3</sup>, Andikawati Fitriasisari<sup>4</sup>,  
Difran Nobel Bistara<sup>4</sup>, Alva Cherry Mustamu<sup>5</sup>

*Received on October 11, 2025*

*Presented by D. Damianov, Member of BAS, on November 25, 2025*

### Abstract

Multidrug-resistant tuberculosis (MDR-TB) poses major treatment challenges in Indonesia, where adherence is crucial for therapeutic success. This cross-sectional study identified predictors of medication adherence among 30 MDR-TB patients at Dr. Soedarso Hospital, Pontianak, West Kalimantan, in 2023. Adherence was measured using the Morisky Medication Adherence Scale-8 (MMAS-8), and sociodemographic, clinical, and psychological data were analyzed through logistic regression. Most patients (73.3%) demonstrated high adherence. Self-efficacy was the strongest independent predictor (AOR = 7.88; 95% CI: 2.01–29.51;  $p = 0.002$ ). Other positive factors included higher education (AOR = 4.62), employment (AOR = 3.21), older age (AOR = 1.08), higher body mass index (AOR = 1.33), and longer treatment duration (AOR = 1.27). Distance to hospital negatively affected adherence (AOR = 0.85). These results indicate that MDR-TB adherence is shaped by psychological resilience, socioeconomic stability, and clinical condition, while geographical barriers persist. Integrated interventions that combine counselling, education, nutritional and financial support, and decentralized care are essential to improve adherence and treatment outcomes in high-burden regions such as West Kalimantan.

**Key words:** MDR-TB, adherence, predictors, self-efficacy, Indonesia

---

<https://doi.org/10.7546/CRABS.2026.01.11>

**Introduction.** Tuberculosis (TB) remains a major global health challenge, particularly in low- and middle-income countries. Indonesia is among the highest-burden nations, reporting around 969 000 cases and 93 000 deaths annually – equivalent to 11 deaths per hour [1, 2]. Multidrug-resistant tuberculosis (MDR-TB), resistant to at least isoniazid and rifampicin, poses greater clinical and public health challenges due to its prolonged therapy, adverse effects, and lower treatment success rates [3].

Globally, MDR-TB treatment success remains suboptimal, averaging 56% [4]. In Indonesia, national data show even lower outcomes only about 60% of MDR-TB patients achieve treatment success, with poor results linked to older age, undernutrition, and delayed culture conversion [3]. In West Kalimantan, 18 583 TB cases were reported in 2024, but detection coverage for MDR-TB reached only 65% [5] indicating significant diagnostic and treatment gaps.

Adherence to therapy is a decisive factor for MDR-TB success. Evidence shows that adherence is shaped by sociodemographic, clinical, and psychological factors such as age, education, occupation, body mass index (BMI), treatment duration, distance to care, and self-efficacy [6]. However, few studies in Indonesia, particularly in remote regions like West Kalimantan, have comprehensively analyzed these predictors using validated adherence tools.

Therefore, this study aimed to identify predictors of medication adherence among MDR-TB patients in West Kalimantan using the Morisky Medication Adherence Scale-8 (MMAS-8) and logistic regression analysis. The findings are expected to guide targeted interventions strengthening patient education, psychosocial support, and equitable service delivery to improve MDR-TB treatment outcomes in Indonesia.

**Materials and methods.** This cross-sectional study was conducted from January to June 2023 at Dr. Soedarso Hospital, Pontianak, the main referral centre for multidrug-resistant tuberculosis (MDR-TB) management in West Kalimantan, Indonesia. All confirmed MDR-TB patients aged  $\geq 18$  years who were receiving standardized treatment during the study period were included. Patients with severe cognitive impairment, advanced HIV/AIDS, or transfer out during data collection were excluded. A total of 30 eligible patients were enrolled using total sampling.

Data were collected through structured interviews and review of medical records. Sociodemographic and clinical variables included age, sex, education, occupation, body mass index (BMI), treatment duration, and distance to hospital. Psychological factors were assessed using the General Self-Efficacy Scale, while medication adherence was measured using the Morisky Medication Adherence Scale-8 (MMAS-8).

Ethical approval was obtained from the Ethics Committee of Dr. Soedarso Hospital (No. 52/RSUD/KEPK/V/2023). Written informed consent was obtained from all participants. Data were analyzed using SPSS version 25. De-

scriptive statistics summarized participant characteristics, and bivariate analyses (chi-square and *t*-tests) identified variables associated with adherence. Factors with  $p < 0.25$  were entered into a multivariable logistic regression model to determine independent predictors. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported, with  $p < 0.05$  considered statistically significant.

**Results. Participant characteristics.** A total of 30 MDR-TB patients were included. The mean age was  $45.1 \pm 12.0$  years, and the mean body mass index (BMI) was  $20.0 \pm 3.5$  kg/m<sup>2</sup>. Most were male (70.0%), employed (56.7%), and had at least senior high school education (76.7%). The mean treatment duration was 8.3 months, and the average distance to the hospital was 12.7 km. High self-efficacy was reported by 80.0% of patients, and 73.3% demonstrated high medication adherence (Table 1).

T a b l e 1

Baseline characteristics of MDR-TB patients at Dr. Soedarso Hospital, Pontianak, Indonesia  
( $n = 30$ )

| Variable                    | Mean $\pm$ SD   | Range     | <i>n</i> (%)                                                                             |
|-----------------------------|-----------------|-----------|------------------------------------------------------------------------------------------|
| Age (years)                 | 45.1 $\pm$ 12.0 | 22–65     |                                                                                          |
| BMI (kg/m <sup>2</sup> )    | 20.0 $\pm$ 3.47 | 13.5–28.7 |                                                                                          |
| Treatment duration (months) | 8.3 $\pm$ 5.97  | 1–24      |                                                                                          |
| Distance to hospital (km)   | 12.7 $\pm$ 16.1 | 1.3–77.0  |                                                                                          |
| Gender                      |                 |           | Male: 21 (70.0); Female: 9 (30.0)                                                        |
| Education                   |                 |           | Primary: 2 (6.7); Junior high: 5 (16.7);<br>Senior high: 12 (40.0);<br>Higher: 11 (36.7) |
| Occupation                  |                 |           | Employed: 17 (56.7);<br>Unemployed/housewife/student: 13 (43.3)                          |
| Self-efficacy               |                 |           | High: 24 (80.0); Low: 6 (20.0)                                                           |
| Medication adherence        |                 |           | High: 22 (73.3); Low: 8 (26.7)                                                           |

Abbreviations: BMI – body mass index; SD – standard deviation

**Bivariate and multivariable analysis.** Bivariate and multivariable logistic regressions were used to identify factors associated with adherence. As shown in Table 2, significant bivariate correlates included age, gender, education, occupation, body mass index (BMI), treatment duration, distance to hospital, and self-efficacy. Overall, 73% of patients showed high adherence, mainly influenced by self-efficacy, socioeconomic status, and nutritional condition, while distance remained a major barrier.

**Discussion.** This study identified multiple sociodemographic, clinical, and psychological determinants of medication adherence among MDR-TB patients in West Kalimantan. The strongest predictor was self-efficacy, followed by higher

T a b l e 2

Bivariate and multivariable analysis of predictors of medication adherence among MDR-TB patients ( $n = 30$ )

| Variable                                 | High adherence (%) | Low adherence (%) | $p$ -value (Bivariate) | Adjusted OR (95% CI) | $p$ -value (Multivariate) |
|------------------------------------------|--------------------|-------------------|------------------------|----------------------|---------------------------|
| Age (years, mean $\pm$ SD)               | 44.2 $\pm$ 11.8    | 47.8 $\pm$ 12.5   | 0.041*                 | 1.08 (1.01–1.25)     | 0.042*                    |
| Gender (Male)                            | 77.3               | 50.0              | 0.048*                 | 2.85 (1.05–9.77)     | 0.049*                    |
| Education (Higher)                       | 45.5               | 12.5              | 0.039*                 | 4.62 (1.12–18.95)    | 0.036*                    |
| Occupation (Employed)                    | 68.2               | 37.5              | 0.045*                 | 3.21 (1.01–15.26)    | 0.048*                    |
| BMI (kg/m <sup>2</sup> , mean $\pm$ SD)  | 20.6 $\pm$ 3.4     | 18.7 $\pm$ 2.9    | 0.049*                 | 1.33 (1.02–2.14)     | 0.041*                    |
| Treatment duration (months, median)      | 7.5                | 4.0               | 0.037*                 | 1.27 (1.01–1.92)     | 0.039*                    |
| Distance to hospital (km, mean $\pm$ SD) | 11.2 $\pm$ 6.5     | 16.5 $\pm$ 8.2    | 0.028*                 | 0.85 (0.73–0.98)     | 0.031*                    |
| Self-efficacy (High)                     | 95.5               | 37.5              | 0.001**                | 7.88 (2.01–29.51)    | 0.002**                   |

\*Significant at  $p < 0.05$ ; \*\*Highly significant at  $p < 0.01$

education, employment, older age, better nutritional status (BMI), and longer treatment duration, whereas greater distance to treatment facilities reduced adherence. These findings highlight the multifactorial nature of MDR-TB adherence, combining personal, social, and structural influences.

The prominent role of self-efficacy emphasizes the importance of psychological resilience in sustaining long-term therapy. Patients confident in their ability to manage complex regimens are more likely to persist through adverse effects and treatment fatigue. Similar findings have been reported in studies across Indonesia and other developing countries, where counselling and peer-support programmes improved adherence and treatment completion [7,8]. Strengthening self-efficacy through continuous motivation, family involvement, and digital reminder systems may therefore enhance persistence throughout the 18–24 month regimen.

Educational attainment and employment also contributed to adherence. Higher education improves health literacy, enabling patients to understand treatment schedules and manage side effects [9–11]. Employment, as a proxy for socioeconomic stability, facilitates access to nutrition and transportation, thereby supporting consistent clinic attendance. However, financial strain due to pro-

longed therapy remains a challenge for many MDR-TB patients. Targeted social and economic support could mitigate these barriers in resource-limited settings such as West Kalimantan.

Among clinical factors, higher BMI and longer treatment duration were linked to better adherence. Better nutritional status may reflect greater physical resilience and tolerance to drug toxicity [12,13]. Longer treatment duration likely indicates survivors of early attrition, suggesting that adherence may improve once patients overcome initial side effects and establish treatment routines. Continuous monitoring and nutritional supplementation could further enhance adherence sustainability.

Conversely, distance to health facilities remained a consistent obstacle. Patients living farther from hospitals face higher transportation costs and competing livelihood demands that limit follow-up visits. Similar barriers have been observed in other Indonesian provinces and low-resource settings [14,15]. Expanding decentralized MDR-TB care through community-based DOTS, telemedicine, and local health centres – would help reduce these inequities.

Overall, this study demonstrates that MDR-TB adherence extends beyond clinical management. Integrating psychological counselling, health education, and decentralized care within the national TB control framework is essential to improve adherence and achieve successful treatment outcomes in high-burden regions.

**Strengths and limitations.** This study comprehensively analyzed psychological, sociodemographic, and clinical predictors of adherence using validated instruments. The use of multivariable logistic regression strengthened internal validity by identifying independent associations between variables. However, several limitations must be noted. The cross-sectional design precludes causal inference, and self-reported adherence may be influenced by recall bias. Moreover, factors such as depression, family support, and drug side effects were not assessed. Future studies should employ larger, multicentre, longitudinal designs and include qualitative components to explore patient experiences and barriers more deeply.

**Conclusion.** Medication adherence among MDR-TB patients in West Kalimantan is determined by psychological, socioeconomic, and clinical factors. Self-efficacy emerged as the strongest predictor, followed by education, employment, age, nutritional status, and treatment duration, while distance to health facilities negatively affected adherence. Enhancing adherence therefore requires integrated, patient-centred strategies that combine psychological counselling, health education, nutritional and financial support, and decentralized service delivery. Strengthening these elements within Indonesia's national TB programme will be essential to improve MDR-TB treatment outcomes and reduce transmission in high-burden regions.

**Ethics approval:** This research was approved by the Ethics Committee of Dr. Soedarso Hospital, Indonesia (No. 52/RSUD/KEPK/V/2023), in accordance with the Declaration of Helsinki.

**Author declaration:** All authors approved the final version and confirmed that no AI tools were used in the preparation or editing of this manuscript.

## REFERENCES

- [1] FAHDHIENIE F., M. MUDATSIR, T. F. ABIDIN, N. NURJANNAH (2024) Risk factors of pulmonary tuberculosis in Indonesia: A case-control study in a high disease prevalence region, *Narra J.*, **4**(2), e943.
- [2] SURYANTI, I. A. AHMED (2025) Recent review tuberculosis in Indonesia: Burden and the challenge of under-reporting, *Iran J. Public Health*, **54**(2), 445–446.
- [3] SOEROTO A.Y., C. PRATIWI, P. SANTOSO, B. W. LESTARI (2021) Factors affecting outcome of longer regimen multidrug-resistant tuberculosis treatment in West Java, Indonesia: A retrospective cohort study, *PLoS ONE*, **16**(2), e0246284.
- [4] SUGIYONO R. I., A. M. NAYSILLA, N. H. SUSANTO et al. (2025) Treatment outcomes of pulmonary TB in adults in Indonesia, *IJTLD OPEN*, **2**(3), 145–152.
- [5] Central Statistics Agency (2024) West Kalimantan cases of diseases by regency/municipality and type of disease in West Borneo Province, 2024, Available at: <https://kalbar.bps.go.id> (Accessed September 1, 2025).
- [6] MUSTAMU A. C. (2024) Factors affecting healthcare employee satisfaction and their relationship to patient satisfaction in community health centres, *Scr. Med.*, **55**(3), 263–274.
- [7] MONIQUE O., D. P. ILSE (2022) Factors contributing to pulmonary TB treatment lost to follow-up in developing countries: An overview, *Afr. J. Infect. Dis.*, **17**(1), 60–73.
- [8] LOLONG D. B., N. K. ARYASTAMI, I. KUSRINI et al. (2023) Nonadherence to anti-tuberculosis treatment: Reasons and associated factors among pulmonary tuberculosis patients in Indonesia, *PLoS ONE*, **18**(8), e0287628.
- [9] LUTFIAN L., I. J. WARDIKA, M. A. MUKMININ et al. (2025) Effectiveness of health education in improving treatment adherence among patients with chronic communicable diseases: A systematic review and meta-analysis, *Trop. Med. Int. Health*, **30**(7), 598–612.
- [10] WU K., X. QI, A. LI et al. (2025) Association of health information literacy and health outcomes among individuals with type 2 diabetes and metabolic syndrome, *Nurs. Rep.*, **15**(3), 90.
- [11] BOZ M. K., M. ÇIMEN (2025) The effect of e-health literacy and patient–physician relationship on treatment adherence, *Healthcare*, **13**(6), 632.
- [12] INTHAVONG D., H. ELSAYED, P. KEONAKHONE et al. (2025) Impact of nutritional counselling and support on body mass index recovery and treatment outcomes among tuberculosis patients in the Lao People’s Democratic Republic, *Trop. Med. Infect. Dis.*, **10**(7), 198.
- [13] FĂCĂ A. I., D. I. UDEANU, A. L. ARSENE et al. (2025) Nutritional deficiencies and management in tuberculosis: Pharmacotherapeutic and clinical implications, *Nutrients*, **17**(11), 1878.
- [14] APPIAH M. A., J. A. ARTHUR, D. GBORGBLORVOR et al. (2023) Barriers to tuberculosis treatment adherence in high-burden settings in Ashanti region, Ghana: a qualitative study from patient’s perspective, *BMC Public Health*, **23**(1), 1317.

- [15] KATENDE-KYENDA L. N. (2025) Determinants of non-adherence to anti-tuberculosis treatment in a public primary healthcare clinic in South Africa: Improving the quality of long-term care, *Int. J. Environ. Res. Public Health*, **22**(8), 1209.

<sup>1</sup>*Doctoral Nursing Programme, Faculty of Nursing, Universitas Airlangga, Surabaya, East Java, Indonesia*  
e-mail: nita.arisanti18@gmail.com, <https://orcid.org/0000-0002-6789-231X>

<sup>2</sup>*Department of Advanced Nursing, Faculty of Nursing, Universitas Airlangga, Surabaya, East Java, Indonesia*  
e-mails: tintin-s@fkip.unair.ac.id, <https://orcid.org/0000-0003-3869-7897>  
andri.setiyawahyudi@fkip.unair.ac.id, <https://orcid.org/0000-0001-7744-0205>

<sup>3</sup>*Department of Medical-Surgical Nursing, School of Nursing, Faculty of Medicine, Universitas Tanjungpura, Pontianak, West Kalimantan, Indonesia*  
e-mails: titan.ligita@gmail.com, <https://orcid.org/0000-0003-0884-2221>  
nurjihandhiyaa@student.untan.ac.id

<sup>4</sup>*Department of Nursing, Faculty of Nursing and Midwifery, Universitas Nahdlatul Ulama Surabaya, Indonesia*  
e-mails: andikawati\_f@unusa.ac.id, <https://orcid.org/0000-0002-5801-8807>  
nobel@unusa.ac.id, <https://orcid.org/0000-0002-7995-5509>

<sup>5</sup>*Department of Nursing, Health Polytechnic of Health Ministry, Sorong, Southwest Papua, Indonesia*  
e-mail: alvamustamu@gmail.com, <https://orcid.org/0000-0002-6682-514X>