

# Correlation of self-efficacy and medication adherence with treatment continuity among tuberculosis patients in East Java, Indonesia

Karyo Karyo,<sup>1,2</sup> Ah Yusuf,<sup>1</sup> Ilya Krisnana,<sup>1</sup> Nursalam Nursalam,<sup>1</sup> Miftahul Munir,<sup>2</sup> Tri Yunita Fitria Damayanti,<sup>2</sup> Kusno Ferianto,<sup>2</sup> Ahmad Daniel<sup>2</sup>

<sup>1</sup>Faculty of Nursing, Airlangga University, Surabaya; <sup>2</sup>Faculty of Nursing and Midwifery, Ilmu Kesehatan Nahdlatul Ulama Tuban Institute, Indonesia

## Abstract

Tuberculosis (TB) remains a significant global health challenge, and treatment adherence is crucial for successful outcomes. This study aimed to investigate the correlation between self-effi-

Correspondence: Karyo Karyo, Faculty of Nursing, Universitas Airlangga, Surabaya; Faculty of Nursing and Midwifery, Institut Ilmu Kesehatan Nahdlatul Ulama Tuban, Indonesia.  
E-mail: karyo.iiknu@gmail.com

Key words: self-efficacy; medication adherence; tuberculosis; treatment continuity; East Java.

Contributions: KK, conceptualization, investigation, data curation, formal analysis, methodology, validation, visualization, writing – original draft & review; AY, conceptualization, methodology, validation, writing – original draft & review; IK, conceptualization, methodology, formal analysis, validation, writing – original draft & review; HH, methodology, visualization, writing – review & editing; NN: resources, investigation, writing – review; MM, formal analysis, validation, writing – review; TYFD, resources, supervision, writing – review; KF, resources, investigation, writing – review; AD, writing – review & editing.

Conflict of interest: the authors declare no potential conflict of interest.

Ethics approval and consent to participate: the study was approved by the Health Research Ethics Commission of the Nahdlatul Ulama Institute of Health Tuban (approval number: 55/0084223523/LEPK. IIKNU/III/2024).

Consent for publication: patients' written informed consent was obtained for anonymized information to be published in this article.

Availability of data and materials: all data generated or analyzed in this study are included in this published article.

Acknowledgments: I extend my gratitude to my supervisor for his guidance in preparing this manuscript as a requirement for the Doctor of Nursing degree at the Faculty of Nursing, Airlangga University. I also thank my colleagues for their assistance in writing this article and my family for their unwavering support and encouragement.

Received: 1 January 2025.

Accepted: 11 March 2025.

Early view: 12 June 2025.

This work is licensed under a Creative Commons Attribution 4.0 License (by-nc 4.0).

©Copyright: the Author(s), 2025

Licensee PAGEPress, Italy

Healthcare in Low-resource Settings 2025; 12(s2):13571

doi:10.4081/hls.2025.13571

*Publisher's note: all claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article or claim that may be made by its manufacturer is not guaranteed or endorsed by the publisher.*

cacy, medication adherence, and treatment continuity among patients with TB in East Java, Indonesia. This cross-sectional, correlational study was conducted in four randomly selected districts of East Java in 2024. The study employed probability sampling with a simple random sampling technique. Data were collected using the Guide for Constructing Self-Efficacy Scale and Morisky Medication Adherence Scale (MMAS-8). A total of 6,792 TB patients participated in this study. Statistical analysis was performed using SPSS version 25, including frequency distribution, percentage calculation, and Spearman's rank correlation test, with a significance level of 0.05. Among the participants, 70.3% (n=4,775) demonstrated high self-efficacy, whereas 29.7% (n=2,017) showed low self-efficacy. Regarding medication adherence, 60% (n=4,075) exhibited high adherence, and 40% (n=2,719) reported low adherence. Spearman's rank correlation test revealed a strong positive correlation between self-efficacy and medication adherence ( $r=0.936$ ,  $p<0.001$ ). The study findings indicated a significant relationship between self-efficacy, medication adherence, and treatment continuity in patients with TB. These results underscore the importance of addressing psychological factors in TB management programs. Interventions aimed at enhancing patients' self-efficacy could potentially improve medication adherence and, consequently, treatment outcomes. These results provide a strong rationale for developing comprehensive care models that incorporate medical and psychological interventions to enhance treatment continuity and improve patient outcomes.

## Introduction

Tuberculosis (TB) remains one of the leading causes of death worldwide. Pulmonary tuberculosis has an estimated annual mortality rate of 27 per 100,000 individuals. Contributing factors include low self-efficacy and non-adherence to anti-tuberculosis treatment, both of which adversely impact recovery rates. Tuberculosis patients undergo treatment for approximately 6 to 9 months, resulting in prolonged exposure to the treatment regimen. One of the psychological factors that affects adherence to taking medication is self-efficacy. A high level of self-efficacy in an individual positively influences their confidence and belief in their capacity to address challenges.<sup>1-3</sup> Self-efficacy, or an individual's belief in their ability to successfully complete a task, is a crucial factor in promoting adherence to TB treatment. Self-care performance mediates the relationship between self-efficacy and health-related quality of life among patients undergoing primary treatment for pulmonary TB. This suggests that self-efficacy plays a vital role in enabling patients to engage in their treatment and improve their health outcomes actively.<sup>4,5</sup> Tuberculosis patients often exhibit diminished self-efficacy, hindering their capacity for self-care and adversely affecting their adherence to prescribed

medication, thereby impeding their recovery due to a lack of confidence in their abilities and commitment to treatment.<sup>5-7</sup>

Pulmonary tuberculosis is a chronic condition, necessitating that patients adhere to a treatment regimen of no fewer than four medications daily during the initial or intensive phase, followed by two medications daily in the subsequent phase, with a minimum treatment duration of six months.<sup>8-10</sup> Treatment over a long period, if not supported by good self-efficacy and regular medication adherence, can significantly affect the recovery rate in pulmonary TB patients. Non-adherence to medication in cases of tuberculosis represents a complex healthcare issue, frequently occurring and involving numerous dimensions related to patients, their care, and/or healthcare providers. In long-term treatment, patient adherence is crucial for understanding patient behavior and attitudes toward the treatment program provided by doctors or healthcare workers. For patients who do not follow the recommended treatment, adverse side effects may occur.<sup>3,8,11,12</sup>

Tuberculosis ranks second among infectious diseases in terms of mortality worldwide. Indonesia is the third highest country globally in tuberculosis cases, with a total of 809,000 individuals affected.<sup>13</sup> In 2023, the number of pulmonary tuberculosis cases in Indonesia rose to 809,000, marking an increase compared to two years earlier. According to the 2023 data, approximately 509,000 pulmonary TB patients were reported as non-compliant with treatment. Similarly, the WHO reported a treatment dropout rate of 535,000 individuals in the same year. In East Java specifically, the regional health profile indicates that 2,073 patients discontinued their TB treatment.<sup>14</sup> Furthermore, a survey conducted on September 21, 2024, gathered data through interviews in several randomly selected representative districts. The findings revealed treatment dropout figures of 1,809 in Pacitan, 1,600 in Lumajang, 1,653 in Tuban, and 1,730 in Mojokerto.

Many pulmonary TB patients fail to complete the full six-month course of anti-TB treatment and are often unaware of the importance of follow-up sputum examinations. This lack of adherence increases their risk of developing drug-resistant forms of tuberculosis and experiencing relapses. Key factors influencing recovery include patients' self-efficacy and medication adherence, both of which are strengthened by support from family or close contacts. Patients who do not consistently follow their treatment regimen frequently face the need to restart therapy from the beginning.<sup>15-17</sup> Tuberculosis patients become non-compliant with treatment due to side effects from the treatment and self-efficacy issues because they suffer from tuberculosis. Another factor contributing to non-compliance in treatment is the lack of motivation and knowledge among tuberculosis patients. Pulmonary TB patients require mental support from both their families and those around them, as this can aid in their recovery.<sup>15,16</sup>

## Materials and Methods

### Design

This study utilized an analytical research design with a correlational approach. The researchers explored the relationships between the variables without intervention. A cross-sectional time design was employed, highlighting that the measurement and observation of both independent and dependent variable data occur only once at a specific point in time. However, employing a cross-sectional design has limitations; specifically, it cannot establish a causal relationship.

### Study participants

The study population consisted of tuberculosis patients from four districts in East Java in 2024. The sample size encompassed these four districts. This study employs probability sampling using a simple random sampling technique. The inclusion criteria included patients with tuberculosis undergoing treatment for a minimum of 6 months in East Java in 2024, aged 18 years or older, and willing to participate in the study. Exclusion criteria included inability to respond to the questionnaire due to physical or mental limitations. To enhance the representativeness, the sample distribution was proportionally drawn from each selected district.

### Variables, instrument, and data collection

This study examined two primary variables, namely self-efficacy and medication adherence among patients with tuberculosis. Two instruments were used for data collection: a questionnaire based on the Guide for Constructing Self-Efficacy Scale, comprising 15 questions to assess self-efficacy, and the Morisky Medication Adherence Scale (MMAS-8), which consists of 8 questions to evaluate medication adherence. Additionally, secondary data from medical records were used to examine the continuity of tuberculosis treatment. The researchers distributed questionnaires to participants in the selected districts. After the data collection and editing process was conducted, the obtained data and answers were selected and checked. Validity and reliability tests were conducted, with the Self-Efficacy Scale demonstrating good internal consistency with a Cronbach's alpha of 0.85 and the MMAS-8 with a Cronbach's alpha of 0.82.

### Data analysis

Data analysis was performed using SPSS software version 25 for Windows. The analysis included frequency distribution, percentage calculation, and Spearman's rank correlation test with a significance level of 0.05. Spearman's rank correlation test was used to measure the relationship between self-efficacy, medication adherence, and continuity of care. This test was chosen because the research variables were ordinal and non-normally distributed. Another justification for selecting this test is its ability to capture the strength and direction of the relationship between independent and dependent variables.

## Results

This study included 6,792 patients with tuberculosis. The results showed that 4,775 (70.3%) patients had high self-efficacy, while 2,017 had low self-efficacy. Regarding medication adherence, 4,075 (60%) patients demonstrated high adherence, whereas 2,719 (40%) showed low adherence. The Spearman's rank correlation test yielded an Asymp Sig. (2-tailed) value of 0.000 and a correlation coefficient of 0.936, indicating a very strong correlation between the variables. A correlation coefficient of 0.936 emphasizes a strong relationship between self-efficacy and medication adherence (Table 1). This highlights the potential of interventions designed to enhance self-efficacy, thereby improving treatment adherence and outcomes.

The high percentage of patients with high self-efficacy (70.3%) was a positive finding, indicating that many patients had confidence in their ability to manage their condition. However, most patients with low medication adherence (40%) highlighted the need for interventions to address this problem.

The demographic profile of patients with TB reveals notable

trends based on recent data from East Java, Indonesia. The majority of tuberculosis cases were found in the productive age group of 19-59 years (70.3%), followed by a smaller percentage in individuals aged 60 years and older (22.5%), and a minor proportion in those under 19 years (7.2%). The gender distribution showed a higher prevalence in males, with the majority of cases occurring in this group (53.77%) than in females (46.3%). Nearly half of the respondents possessed primary school education (42.7%), approximately one-third had junior high school education (28.3%), a minor percentage completed senior high school (22.5%), and a small fraction (6.5%) attained a university degree (Table 2).

## Discussion

Self-efficacy plays a crucial role in treatment adherence and overall management of tuberculosis (TB). Recent studies have shown that patients with TB who have higher levels of self-efficacy tend to have better treatment outcomes and a higher quality of life.<sup>1,8,18</sup> The concept of self-efficacy in TB patients encompasses their belief in their ability to follow treatment protocols, manage symptoms, and prevent disease transmission.<sup>1,16,19,20</sup> This psychological construct is particularly important given the long duration of TB treatment, which typically lasts 6-9 months. Patients with strong self-efficacy are better equipped to overcome the challenges associated with prolonged treatment, including potential side effects and the need for lifestyle improvements.<sup>1,21,22</sup> Self-efficacy in TB patients is not static but can be enhanced through targeted interventions.

Health education programs, counseling sessions, and peer support groups have been shown to improve self-efficacy levels among TB patients.<sup>23,24</sup> These interventions help patients develop a more positive outlook on their treatment journey and increase their confidence in managing their condition. However, it is important to note that self-efficacy can be influenced by various factors, including socioeconomic status, education level, and cultural beliefs. A comprehensive approach that addresses these underlying factors is necessary to effectively boost self-efficacy in TB patients. Future research should focus on developing tailored interventions that consider these diverse influences on self-efficacy.<sup>7,25</sup>

Medication adherence is a critical factor in the successful treatment of tuberculosis. Recent evidence indicates that adherence strongly influences therapy outcomes and the risk of developing drug-resistant TB. A meta-analysis of three Phase III trials found that non-adherence was the single most potent factor associated with unfavorable treatment outcomes, with adjusted hazard ratios of 5.7 for patients who missed 10% or more of prescribed doses. The challenges of maintaining high levels of medication adherence in TB treatment are complex. Factors such as the long duration of treatment, potential side effects, and socioeconomic barriers can all contribute to non-adherence.

Recent technological advancements have introduced new methods for monitoring and improving medication adherence.<sup>7,26</sup> Electronic monitoring devices, mobile health applications, and directly observed therapy (DOT) using video technology are being increasingly utilized to support patients in maintaining adherence. These tools not only help in tracking adherence but also provide real-time support and reminders to patients. Despite these advancements, there is a growing recognition that a one-size-fits-all approach to medication adherence is insufficient.<sup>19,27</sup> Tailored interventions that consider individual patient needs, cultural contexts, and social support systems are necessary to achieve optimal

adherence rates. Future research should focus on developing and evaluating personalized adherence interventions that can be integrated into routine TB care.<sup>28,29</sup>

The results show that the majority of tuberculosis patients have high self-efficacy, while a significant portion experiences low self-efficacy. Similarly, most patients exhibit high medication adherence, but a notable percentage struggles with low adherence. This low adherence is associated with treatment failure and poor quality of life. Low self-efficacy and poor medication adherence are closely linked to a person's physiological condition and mental state. When physical health deteriorates or when an individual experiences stress, emotional disturbances, or misconceptions about their medical condition, self-efficacy can decline. Negative and pessimistic self-evaluations also contribute to reduced self-efficacy. For tuberculosis patients, having a strong sense of self-efficacy is essential, as it fosters the self-confidence needed to stay motivated and committed to completing the treatment. Self-efficacy reflects an individual's belief in their ability to overcome challenges, which significantly influences both their thought processes and behaviors.<sup>1,30,31</sup>

The continuity of treatment is essential for achieving a cure and preventing the development of drug-resistant TB. Recent studies have emphasized the importance of uninterrupted therapy in

**Table 1.** Crosstabulation of self-efficacy, medication adherence, and continuity of tuberculosis treatment.

Characteristic	Continuity treatment		Total
	Yes	No	
Self-efficacy			
Low	1432	585	2017
High	3769	1006	4775
Medication adherence			
Low	1870	849	2719
High	2472	1601	4073

Spearman's test result: 0.000

**Table 2.** Characteristics of participants.

Characteristic	Number	%
Age		
18 years	489	7.2
19-44 years	2038	30
45-59 years	2738	40.3
≥60 years	1529	22.5
Gender		
Male	3653	53.7
Female	3139	46.3
Education		
Elementary school	2899	42.7
Junior high school	1920	28.3
Senior high school	1523	22.5
Undergraduate	442	6.5
Self-efficacy		
Low	2017	30
High	4775	70
Medication adherence		
Low	2717	40
High	4075	60
Continuity treatment		
Yes	4822	71
No	1970	29

improving patient outcomes and reducing the risk of disease transmission. The treatment interruptions, even if brief, can significantly impact the effectiveness of TB therapy. Factors affecting treatment continuity are complex and often interrelated. These may include healthcare system factors (such as drug availability and accessibility of healthcare services), patient-related factors (including side effects and competing life priorities), and social determinants of health. Addressing these multifaceted challenges requires a comprehensive approach that goes beyond simply focusing on individual patient behavior. Innovative approaches to ensure treatment continuity have emerged in recent years. These include the use of community-based DOT, patient support groups, and integrated care models that address both TB and other health needs. Such approaches have shown promise in improving treatment continuity, particularly in resource-limited settings.<sup>32,33</sup>

This study revealed a strong positive correlation between self-efficacy and medication adherence among patients with TB in East Java, Indonesia. However, it is crucial to consider potential confounding variables and biases that might have influenced these findings among other socioeconomic, educational, cultural, and health-service systems.

## Conclusions

This study confirms a significant relationship between self-efficacy, medication adherence, and TB treatment continuity in East Java. Despite high self-efficacy, low adherence highlights the need for integrated medical and psychological interventions. A holistic approach can enhance patient confidence, improve outcomes, and reduce the risk of infections. Policymakers and healthcare providers should prioritize strategies that strengthen adherence and treatment success.

## References

- Marselina S, Kusmiran E, Sutisna I. The relationship between self efficacy and medication compliance in tuberculosis patient-S at Garuda Health Center in Bandung City in 2023. *Indones J Community Heal Nurs* 2024;9:67-72.
- Marin PM, Munyeme M, Kankya C, et al. Medication nonadherence and associated factors in patients with tuberculosis in Wau, South Sudan: a cross-sectional study using the world health organization multidimensional adherence model. *Arch Public Heal* 2024;82:1-10.
- Areas Lisboa Netto T, Diniz BD, Odutola P, et al. Video-observed therapy (VOT) vs directly observed therapy (DOT) for tuberculosis treatment: A systematic review on adherence, cost of treatment observation, time spent observing treatment and patient satisfaction. *PLoS Negl Trop Dis* 2024;18:e0012565.
- Lim RK, Semitala FC, Atuhumuza E, et al. Patient choice improves self-efficacy and intention to complete tuberculosis preventive therapy in a routine HIV program setting in Uganda. *PLoS One* 2021;16:1-6.
- Ju LH, Jiyoung P. Self-care efficacy and health-related quality of life among patients on primary treatment for pulmonary tuberculosis: The mediating effects of self-care performance. *Korean J Adult Nurs* 2020;32:305-14.
- Deshmukh AF, Deshmukh J, Gode Y, et al. Assess the effectiveness of an inquiry based learning method in microbiology for undergraduate medical students. *E3S Web Conf* 2024;491.
- Alves YM, Berra TZ, De Jesus SV, et al. Adherence to short-duration treatment (3HP) for latent tuberculosis among international migrants in Manaus, Amazonas: evaluation of the efficacy of different treatment modalities. *Microorganisms* 2024;12.
- Lienhardt C, Dooley KE, Nahid P, et al. Target regimen profiles for tuberculosis treatment. *Bull World Health Organ* 2024;102:600-7.
- So MW, Kim AR, Lee SG. Drug persistence and incidence of active tuberculosis of tumor necrosis factor alpha inhibitors versus tocilizumab as the first-line biological treatment in patients with rheumatoid arthritis: a nationwide population-based retrospective cohort analysis. *Rheumatol Ther* 2024;11:881-95.
- Sodhi R, Vatsyayan V, Panibatla V, et al. Impact of a pilot mHealth intervention on treatment outcomes of TB patients seeking care in the private sector using Propensity Scores Matching-Evidence collated from New Delhi, India. *PLOS Digit Health* 2024;3:e0000421.
- Xia T, Chen J, Rui J, et al. What affected Chinese parents' decisions about tuberculosis (TB) treatment: Implications based on a cross-sectional survey. *PLoS One* 2021;16:1-11.
- Leyto SM, Digesa LE, Lakew S, et al. Tuberculosis patients' satisfaction with directly observed treatment short course strategy and associated factors in Southern Ethiopia: a mixed method study. *BMC Public Health* 2024;24:2452.
- Anindhita M, Haniifah M, Putri AMN, et al. Community-based psychosocial support interventions to reduce stigma and improve mental health of people with infectious diseases: a scoping review. *Infect Dis Poverty* 2024;13:1-17.
- Aryantiningasih DS, Jalinus N, Rosalina L. EduTB as an Effort to Improve Tuberculosis Treatment Adherence. *Univers J Public Heal* 2024;12:441-59.
- Awaluddin SM, Ismail N, Yasin SM, et al. Parents' experiences and perspectives toward tuberculosis treatment success among children in Malaysia: A qualitative study. *Front Public Heal* 2020;8:1-8.
- Islam F, Ahmad H, Nurbaya, et al. Factors affecting treatment adherence among patients with tuberculosis in Indonesia: literature review. *J Public Heal Pharm* 2024;4:28-37.
- Mukooza E, Schausberger B, Mmemma N, et al. Understanding the role of video direct observed therapy for patients on an oral short-course regimen for multi-drug resistant tuberculosis: findings from a qualitative study in Eswatini. *BMC Infect Dis* 2024;24:829.
- Arthur K, Christofides N, Nelson G. Development of a pre-adolescent inter-generational intervention to address HIV and obesity using intervention mapping. *Health Educ J* 2020;79:932-47.
- Parwati NM, Bakta IM, Januraga PP, Wirawan IMA. A health belief model-based motivational interviewing for medication adherence and treatment success in pulmonary tuberculosis patients. *Int J Environ Res Public Health* 2021;18:13238.
- Ro'isah, Anies, Sakundarno M, Jazuli N. TB community empowerment model instruments in finding tuberculosis (TB) suspects. *Bali Med J* 2022;11:551-4.
- Joshi B, De Lima YV, Massom DM, et al. Acceptability of decentralizing childhood tuberculosis diagnosis in low-income countries with high tuberculosis incidence: Experiences and perceptions from health care workers in Sub-Saharan Africa and South-East Asia. *PLOS Glob Public Heal* 2023;3:1-24.
- Schaaf HS, Hughes J. Current treatment of drug-resistant

- tuberculosis in children. *Indian J Pediatr* 2024;91:806-16.
23. Fuadiati LL, Sukartini T, Makhfudli, et al. Development of an EKA application to help tuberculosis patients improve medication adherence and self efficacy. *Int J Public Heal Sci* 2024;13:76-86.
  24. Matos VC, Torres TS, Luz PM. Adherence to antiretroviral therapy among cisgender gay, bisexual and other men who have sex with men in Brazil: Evaluating the role of HIV-related stigma dimensions. *PLoS One* 2024;19:1-20.
  25. Khodaveisi M, Fallah SV, Amini R, Tapak L. Effect of education based on the health belief model on treatment adherence in patients with heart valve replacement surgery. *J Educ Community Heal* 2023;10:35-42.
  26. Alemu GG, Tesfie TK, Yayeh AT, et al. Incidence of anaemia and its predictors among HIV-infected children receiving highly active antiretroviral treatment in North-West Ethiopia: a multicentre retrospective follow-up study. *BMJ Open* 2024;14:e083939.
  27. Sofiana L, Ayu SM, Wardani Y, et al. Risk factors of quality of life among tuberculosis patients. *Int J Public Heal Sci* 2022;11:756-62.
  28. Gebremariam RB, Wolde M, Beyene A. Determinants of adherence to anti-TB treatment and associated factors among adult TB patients in Gondar city administration, Northwest, Ethiopia: based on health belief model perspective. *J Heal Popul Nutr* 2021;40:1-10.
  29. Girma S, Agenagnew L, Beressa G, Tesfaye Y, Alenko A. Risk perception and precautionary health behavior toward COVID-19 among health professionals working in selected public university hospitals in Ethiopia. *PLoS One* 2020;15:1-9.
  30. Tegegnetwork AZ, Aemiro MT, Bilchut AH, et al. Completion of tuberculosis preventive therapy and associated factors among clients on antiretroviral therapy at Debre Berhan town health facilities, North Shoa Zone, Ethiopia. *AIDS Res Ther* 2024;21:1-5.
  31. Phadoongmai M, Jariya W. Tuberculosis preventive behaviors and their determining factors among household contacts of tuberculosis patients in Thailand: a cross-sectional study. *Open Public Health J* 2024;17:1-10.
  32. Moonsarn S, Kasetjaroen Y, Bettex-Baars AM, Phanumartwiwath A. A communication-based intervention study for reducing stigma and discrimination against tuberculosis among thai high-school students. *Int J Environ Res Public Health* 2023;20.
  33. Malini H, Huriani E, Lenggogeni DP, Herlina S. Health education on multidrug-resistant tuberculosis prevention among tuberculosis patients. *Int J Public Heal Sci* 2021;10:27-32.