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Impact of Antituberculosis Medication Adherence on Quality of Life in Pulmonary TB Patients

Neni Ristiani[1*], Eva Oktariani[2]

[1,2] *Faculty of Medicine, Abdurrab University, Jl. Bakti No. 32 Pekanbaru 28282, Indonesia*

* *Corresponding Author. Email: neni.ristiani@univrab.ac.id*

ABSTRACT

Tuberculosis (TB) remains a major global public health problem, including in Indonesia. TB affects not only physical health but is also associated with psychological and social burdens, ultimately reducing patients' quality of life. The quality of life of TB patients is strongly influenced by the treatment process, particularly adherence to antituberculosis drugs (OAT). The prolonged duration of TB treatment often challenges patients' ability to remain adherent, despite its crucial role in recovery and prevention of drug resistance. This analytical observational study employed a cross-sectional design with total sampling and involved 37 pulmonary TB patients undergoing treatment at Pekanbaru City Health Centre, Indonesia. Data were collected using the MMAS-8 scale to assess medication adherence and the WHOQOL-BREF instrument to measure quality of life. Data analysis was performed using the Spearman correlation test. The results showed a significant relationship between adherence to antituberculosis medication and quality of life ($p < 0.001$, $r = 0.572$), indicating a moderate positive correlation. These findings underscore the importance of strengthening treatment adherence as a key strategy to improve clinical outcomes and enhance the overall well-being of TB patients. It is recommended that TB control programs integrate patient education, psychosocial support, and management of treatment-related burdens to sustain high adherence and optimize quality of life.

Keywords:
Antituberculosis drugs; Medication adherence; Tuberculosis; Quality of life; MMAS-8; WHOQOL-BREF

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1. Introduction

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* and transmitted through the air when a patient coughs, sneezes, or spits, dispersing bacteria that may be inhaled by others. Without treatment, one TB patient can transmit the infection to 10–15 people in their surroundings. Effective prevention measures include early detection, prompt initiation of therapy, and complete treatment to stop transmission. TB control strategies encompass prevention, early diagnosis, and treatment using a combination of antituberculosis drugs (OAT) consisting of rifampicin, isoniazid, pyrazinamide, and ethambutol. Non-standardized treatment carries the risk of therapeutic failure and the development of drug resistance [1].

Globally, TB ranks as the second leading cause of death from infectious agents, with more than 10 million cases annually. Without therapeutic intervention, the mortality rate can reach 50%, but with World Health Organization (WHO)-recommended regimens, cure rates can be as high as 85% [2]. Indonesia has the second-highest TB incidence worldwide after India, contributing approximately 10% of all

global cases. In 2022, the TB incidence rate in Indonesia was 385 per 100,000 population, with a mortality rate of 49 per 100,000 population [3]. In Riau Province, there were 13,007 TB cases, with Pekanbaru City reporting the highest number at 3,361 cases in 2022 [4]. In the working area of Puskesmas Pekanbaru Kota, 657 suspected TB patients were recorded in 2023, and 48 were confirmed smear-positive and undergoing treatment [5].

The burden of pulmonary TB cases continues to rise both globally and nationally. Patients require prolonged treatment, taking medications regularly until declared cured, in order to achieve successful outcomes [3]. Adherence to OAT has been shown to significantly improve the quality of life of pulmonary TB patients. A longitudinal study in South Africa found that quality of life improved over time even though adherence remained stable, with highly adherent patients experiencing notable reductions in anxiety and depression after six months of therapy [6]. Similarly, an Indonesian study reported a statistically significant difference ($p < 0.001$) between OAT adherence and quality of life, confirming adherence as a key determinant of patient health and well-being [7].

Puskesmas Pekanbaru Kota, located in the Pekanbaru Kota sub-district with a population of 28,203 people in 5,158 households, implements the "Find, Treat, Until Cured" (TOSS TB) program. This initiative targets a 90% reduction in TB incidence and a 95% reduction in TB mortality by 2030 through comprehensive, integrated, and synergistic strategies. Activities include public education on TB symptoms, the urgency of sputum examination, the importance of regular medication, recognition of OAT side effects, and management strategies.

The purpose of this study was to analyze the relationship between adherence to anti-TB medication and the quality of life of pulmonary TB patients in the working area of Pekanbaru City Health Centre. The findings are expected to contribute to TB control strategies and serve as a basis for health policy development that emphasizes not only clinical cure but also holistic improvements in patients' quality of life.

2. Methods

Study Design and Setting

This research employed an observational analytic study with a cross-sectional design, conducted in the working area of Pekanbaru City Health Centre from January to April 2024. The Pekanbaru City Health Centre serves a population of 28,203 people and implements the "Find, Treat, Until Cured" (TOSS TB) program as part of the national tuberculosis control strategy [5].

Population and Sample

The study population comprised all patients diagnosed with pulmonary tuberculosis and undergoing treatment at Pekanbaru City Health Centre during the study period. A total sampling technique was used, resulting in 48 eligible participants. Inclusion criteria were: (1) confirmed diagnosis of pulmonary TB by smear microscopy, (2) currently receiving antituberculosis therapy, and (3) willingness to participate in the study. Exclusion criteria included patients with incomplete medical records or comorbidities severely affecting quality of life.

Instruments

Medication adherence was measured using the Morisky Medication Adherence Scale-8 (MMAS-8), a validated self-report questionnaire designed to assess patients' adherence to prescribed regimens [6]. Quality of life was measured using the WHOQOL-BREF instrument, which evaluates physical, psychological, social, and environmental

domains [5]. Both instruments have been widely used in TB-related research in Indonesia and internationally.

Data Collection Procedures

Data were collected through structured interviews and review of medical records. Trained enumerators administered the questionnaires to ensure data accuracy and minimize response bias. Demographic characteristics (age, gender, education, occupation) were also recorded.

Data Analysis

Data were analyzed using univariate and bivariate statistical methods. Univariate analysis was performed to describe the frequency distribution of respondents' characteristics. Data normality was tested using the Shapiro–Wilk test. Variables not normally distributed ($p < 0.05$) were analyzed using the Spearman rank correlation test to assess the relationship between medication adherence and quality of life [8],[9]

Ethical Considerations

The study obtained ethical clearance from the Health Research Ethics Committee of Abdurrab University, approval number 004321/Komite Etik Penelitian (KEP) Universitas Abdurrab/2025. All participants provided informed consent prior to participation, and their confidentiality was maintained throughout the study in accordance with ethical guidelines for health research [12].

3. Results and Discussion

Characteristics of Respondents

Understanding the socio-demographic characteristics of respondents is essential for interpreting the study findings, as these factors can influence both medication adherence and quality of life in pulmonary tuberculosis (TB) patients. Variables such as gender, educational background, and occupation are known to affect patients' health perceptions, access to healthcare, and ability to follow long-term treatment regimens [8]. Socioeconomic status and health literacy have also been reported as significant determinants of adherence in TB management [8], [9]. Gender-related patterns in TB incidence and adherence levels further highlight the importance of analyzing respondent characteristics in detail [10]. The characteristics of the 37 respondents who met the inclusion criteria in this study are presented in **Table 1**.

The results indicate that most respondents were male (62.2%), which is consistent with previous studies showing that TB prevalence is higher among men [10]. The majority had junior or senior high school education (62.2%), while a smaller proportion had higher education (21.6%) or no formal schooling (10.8%).

In terms of occupation, the largest group was employed (37.8%), followed by unemployed individuals (35.2%) and students (27.0%). Employment status has been linked to better adherence, as it may reflect more stable socioeconomic conditions [11].

Regarding treatment adherence, more than half of respondents (54.1%) demonstrated medium adherence to OAT, while 27.0% had high adherence and 18.9% had low adherence. This pattern indicates that sustaining consistently high adherence remains a challenge [8].

Table 1. Characteristics of research respondents

No	Characteristics	n	%
1	Gender		
	Male	23	62.2
	Female	14	37.8
2	Education		
	Not in school	4	10.8
	Primary school	2	5.4
	Junior/High school	23	62.2
	Higher education	8	21.6
3	Occupation		
	Not employed	13	35.2
	Employee	14	37.8
	Student	10	27.0
4	Compliance level		
	High compliance	10	27.0
	Medium compliance	20	54.1
	Low compliance	7	18.9
5	Quality of life		
	Good	34	91.9
	Poor	3	8.1

Source: Primary data

In terms of quality of life, a substantial majority (91.9%) reported good quality of life, with only 8.1% reporting poor quality of life. Previous research supports the finding that TB patients with better adherence often achieve higher health-related quality of life scores [12].

Factors Influencing Medication Adherence

Medication adherence among tuberculosis patients is influenced by a complex interplay of socio-demographic, economic, psychological, and health system factors. Socio-demographic characteristics such as age, gender, educational level, and occupation have been identified as important determinants of adherence [8]. Patients with higher education levels often demonstrate better understanding of treatment regimens and the importance of completing therapy, leading to improved adherence [11].

Economic conditions also play a significant role. Patients with stable employment and sufficient income are more likely to fulfill basic needs and maintain consistent access to healthcare services, thereby supporting treatment adherence [11]. Conversely, economic hardship may lead to prioritization of daily survival needs over health, contributing to missed doses or discontinuation of therapy [8].

Health-related perceptions, severity of symptoms, and presence of comorbidities can influence adherence behavior. Patients experiencing severe symptoms may be more motivated to follow their treatment plans, while those who feel better prematurely may stop treatment early, risking relapse or drug resistance [9].

Access to health services is another critical factor. Long waiting times, geographic distance, and inadequate patient–healthcare worker communication can hinder

adherence [8]. The quality of the patient–healthcare worker relationship is particularly important; supportive and respectful interactions encourage patients to continue their medication regimens [9].

Gender-specific patterns have also been reported, with male patients generally exhibiting lower adherence rates compared to females. Adherence has been shown to mediate the relationship between gender and TB treatment outcomes, indicating the need for gender-sensitive intervention strategies [10].

Cultural and psychosocial factors, including stigma, fear of discrimination, and conflicting traditional health beliefs, may discourage patients from seeking treatment or adhering to prescribed regimens [12]. In some cases, limited health literacy, language barriers, and mental health conditions such as depression further complicate adherence [9].

Overall, improving TB medication adherence requires a multifaceted approach that addresses not only the medical aspects of treatment but also the socio-economic, cultural, and systemic barriers faced by patients.

Relationship between OAT Adherence and Quality of Life

The relationship between adherence to antituberculosis drugs (OAT) and the quality of life of pulmonary TB patients in the Pekanbaru City Health Centre area is presented in **Table 2**.

Table 2. The relationship between adherence to OAT with the quality of life of TB patients

Compliance level	Quality of life		Total	P value	r
	Good (n, %)	Poor (n, %)	n (%)		
High compliance	5 (13.5)	2 (5.4)	7 (18.9)	0.000	0.572
Moderate compliance	19 (51.4)	1 (2.7)	20 (54.1)		
Low compliance	10 (27.0)	0 (0.0)	10 (27.0)		
Total	34 (91.9)	3 (8.1)	37 (100)		

Source : primary data

The findings indicate that 91.9% of respondents reported good quality of life, while 8.1% reported poor quality of life. The group with moderate adherence had the highest proportion of good quality of life (51.4%), followed by low adherence (27.0%) and high adherence (13.5%). Interestingly, no respondents in the low adherence group reported poor quality of life, whereas some in the high adherence group did.

The statistical analysis using Spearman's correlation showed a p-value of < 0.001 and a correlation coefficient (r) of 0.572, indicating a moderate positive correlation between OAT adherence and quality of life. This suggests that as adherence increases, quality of life also tends to improve, although other factors may influence this relationship.

These results are consistent with previous studies, such as Amalia et al., which reported a significant relationship between OAT adherence and quality of life among pulmonary TB patients, with a correlation coefficient of 0.846 indicating a strong positive relationship [13]. Other research has also highlighted that adherence to treatment in chronic diseases like TB is crucial to prevent treatment failure and relapse, both of which can severely affect quality of life [14].

Patients who adhere to their treatment regimens typically experience faster symptom relief, reduced physical limitations, and better psychological well-being.

Adherence can also prevent relapse and drug resistance, leading to better long-term outcomes [15]. Conversely, poor adherence increases the likelihood of disease recurrence, prolonged infectiousness, and diminished quality of life [16].

Interestingly, in this study, the moderate adherence group reported a higher percentage of good quality of life than the high adherence group. This counterintuitive finding may be explained by treatment-related burdens in the high adherence group, such as drug side effects, social restrictions, and psychological fatigue from strict regimen adherence. These factors may temporarily lower perceived quality of life despite the medical benefits of high adherence [17].

Interpretation of Counterintuitive Findings

Although high adherence is generally associated with improved clinical outcomes and better health-related quality of life (HRQoL) in tuberculosis patients, this study revealed an unexpected pattern: respondents in the moderate adherence group reported a higher proportion of good quality of life compared to those in the high adherence group. This counterintuitive finding warrants further consideration.

One possible explanation is that patients with high adherence may experience treatment-related burdens, including adverse drug reactions, dietary restrictions, and frequent clinical visits, which could temporarily lower their perceived quality of life despite the long-term health benefits [17]. Some studies have noted that strict adherence may increase treatment fatigue, particularly in regimens lasting six months or longer, leading to psychological distress and diminished social participation [14].

In contrast, patients with moderate adherence might perceive greater autonomy and less lifestyle disruption, which can positively influence their subjective quality of life in the short term. While their adherence level is not optimal from a clinical perspective, the reduced treatment burden may result in fewer perceived restrictions and a more favorable self-assessment of well-being [17].

Additionally, this finding may reflect the influence of unmeasured confounding factors such as coping mechanisms, social support networks, and personal health beliefs, which have been shown to shape quality of life independently of adherence level [9]. The small sample size (n = 37) in this study could also contribute to the observed pattern, as statistical variability is greater in smaller cohorts, potentially amplifying differences between groups.

These findings highlight the need for a more nuanced approach to adherence promotion one that not only focuses on maximizing medication intake but also addresses the psychosocial challenges faced by patients during prolonged TB treatment.

Implications for TB Control Programs

The findings of this study underscore the critical role of medication adherence in improving the quality of life among pulmonary tuberculosis patients. Strengthening adherence should therefore be a central component of TB control strategies, alongside case detection and timely initiation of therapy [1]. The moderate positive correlation observed between adherence and quality of life ($r = 0.572$) suggests that interventions aimed at improving adherence can yield substantial benefits for patients' physical, psychological, social, and environmental well-being [6].

The TOSS TB program implemented at Pekanbaru City Health Centre already incorporates patient education, regular monitoring, and community outreach [5]. However, the counterintuitive finding that moderate adherence was associated with a higher proportion of good quality of life than high adherence highlights the importance

of integrating psychosocial support into adherence interventions. Strategies such as counseling to manage treatment fatigue, addressing adverse drug reactions promptly, and providing social support could help maintain quality of life while ensuring high adherence [17].

Evidence from other settings shows that multifaceted approaches combining medical supervision, patient-centered communication, family involvement, and socioeconomic support are more effective in sustaining adherence compared to strategies focusing solely on medication monitoring [9]. Gender-specific and culturally sensitive interventions may also be necessary, given documented differences in adherence patterns between male and female patients [10].

Ultimately, TB control programs must strike a balance between the biomedical goal of achieving optimal adherence and the humanistic goal of preserving patients' overall well-being. This dual focus aligns with the broader objective of TB elimination, which not only aims to reduce incidence and mortality but also to enhance the quality of life of those affected [2],[3].

This study was limited by its small sample size (n = 37) from a single health centre, reducing generalizability. The cross-sectional design prevents establishing causality between adherence and quality of life. Self-reported adherence (MMAS-8) may be subject to recall and social desirability bias. Potential confounders such as mental health status, social support, and clinical variables were not assessed. The counterintuitive finding that moderate adherence corresponded to higher reported quality of life may reflect unmeasured psychosocial factors or sample variability.

4. Conclusion

There is a significant relationship between adherence to antituberculosis drugs and the quality of life of pulmonary tuberculosis patients at Pekanbaru City Health Centre ($p < 0.001$, $r = 0.572$), indicating a moderate positive correlation. Improving adherence can enhance patients' physical, psychological, social, and environmental well-being; therefore, TB control programs should integrate strategies that promote high adherence while addressing psychosocial factors and minimizing treatment-related burdens. It is recommended that health services strengthen patient education, provide counseling, manage drug side effects effectively, and implement gender-sensitive interventions. Future research with larger, more diverse samples and longitudinal designs is needed to clarify the causal relationship between adherence and quality of life and to develop sustainable, patient-centered adherence strategies.

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Conflicts of Interest:

The authors declare that there is no conflict of interest regarding the publication of this paper.

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