
The Relationship Between Patient Knowledge, Family Support, and Treatment Supervisors with Tuberculosis Medication Adherence

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Abstract

Tuberculosis remains a major public health problem globally and in Indonesia, with medication adherence playing a crucial role in treatment success and prevention of drug resistance. Non-adherence to tuberculosis treatment contributes to treatment failure, disease recurrence, and ongoing transmission. Previous studies have indicated that individual, familial, and supervisory factors influence adherence; however, evidence from primary healthcare settings remains limited. This study aimed to examine the relationship between patient knowledge, family support, and treatment supervisors with tuberculosis medication adherence among pulmonary tuberculosis patients in a primary healthcare setting. A quantitative cross-sectional study was conducted in the working area of UPTD Puskesmas Kemalaraja, Ogan Komering Ulu Regency, Indonesia, in July 2025. The study population consisted of 34 pulmonary tuberculosis patients, and total sampling was applied. Data were collected through structured interviews using validated questionnaires measuring medication adherence, patient knowledge, family support, and the role of treatment supervisors. Univariate analysis was used to describe variable distributions, while bivariate analysis was performed using the Chi-square test with a significance level of 0.05. The findings showed that most patients had moderate medication adherence (47.1%). Patient knowledge was predominantly at a moderate level (52.9%), family support was mostly high (50.0%), and treatment supervisor involvement was largely high (58.8%). Statistical analysis revealed significant associations between patient knowledge and medication adherence ($p = 0.003$), family support and medication adherence ($p = 0.022$), and treatment supervisors and medication adherence ($p = 0.039$). Patient knowledge, family support, and treatment supervisors were significantly associated with tuberculosis medication adherence. Higher knowledge levels, strong family support, and active treatment supervision were linked to better adherence outcomes.

Keywords: Family Support, Medication Adherence, Primary Health Care, Tuberculosis, Treatment Supervision

INTRODUCTION

Tuberculosis remains a major global public health problem that affects millions of people worldwide due to infection caused by *Mycobacterium tuberculosis* in pulmonary tissues (WHO, 2022). The World Health Organization recognizes pulmonary tuberculosis as a persistent international epidemic that continues to challenge health systems, particularly in low- and middle-income countries (WHO, 2022). Global epidemiological data indicate that tuberculosis contributes significantly to morbidity and mortality despite the availability of effective treatment regimens and prevention strategies (Kemenkes RI, 2022). The Global Tuberculosis Report documented approximately ten million tuberculosis cases and 1.5 million deaths globally in 2020, reflecting the ongoing severity of this disease burden (WHO, 2022). Southeast Asia accounted for a substantial proportion of global tuberculosis cases, highlighting regional vulnerability related to population density and health service access (WHO, 2022). Indonesia is consistently ranked among countries with the highest tuberculosis burden, indicating a sustained national public health challenge (Kemenkes RI, 2022). These global and regional patterns demonstrate the urgent need for comprehensive tuberculosis control strategies focusing on treatment adherence to reduce transmission and mortality rates (WHO, 2022).

Indonesia experiences a high incidence of pulmonary tuberculosis, with national surveillance data showing a steady increase in reported cases in recent years (Kemenkes RI, 2022). National health statistics revealed that Indonesia recorded approximately 969,000 tuberculosis cases, representing one of the highest case loads globally (Kemenkes RI, 2022). Mortality due to tuberculosis in Indonesia increased significantly, indicating gaps in treatment continuity and patient adherence (Kemenkes RI, 2022). The Ministry of Health emphasized that non-adherence to tuberculosis treatment contributes to

treatment failure, disease recurrence, and the emergence of multidrug-resistant tuberculosis (Kemenkes RI, 2022). Provincial data from South Sumatra demonstrated a consistent rise in pulmonary tuberculosis cases between 2021 and 2023, reflecting local transmission dynamics (Dinkes Provinsi Sumsel, 2023). District-level data further indicated that Ogan Komering Ulu recorded hundreds of pulmonary tuberculosis cases, emphasizing the local disease burden (Dinkes Provinsi Sumsel, 2022). These epidemiological trends underscore the importance of strengthening adherence-related determinants at the primary healthcare level (Dinkes Provinsi Sumsel, 2023).

Tuberculosis medication adherence represents a critical determinant of treatment success and disease control within primary healthcare systems (Kemenkes RI, 2022). Adherence to anti-tuberculosis drugs requires patients to consume medications regularly for an extended period, which often creates behavioral and psychosocial challenges (Wahdi & Puspitosari, 2021). Poor adherence can result in prolonged infectiousness, increased healthcare costs, and the development of drug-resistant strains of tuberculosis (WHO, 2022). Studies in Indonesia have shown that adherence rates among tuberculosis patients remain suboptimal due to multiple interacting factors (Apriyanti & Novitry, 2024). Healthcare providers emphasize that improving adherence requires addressing patient-related, family-related, and system-related factors simultaneously (Surati et al., 2023). Primary healthcare facilities play a strategic role in monitoring patient adherence through structured tuberculosis control programs such as DOTS (Felisa Ramayanti et al., 2024). Therefore, understanding factors associated with medication adherence is essential to strengthening tuberculosis control efforts at the community level (Hastono, 2020).

Patient knowledge has been identified as a key factor influencing tuberculosis medication adherence by shaping awareness and health-related behaviors (Swarjana, 2022). Adequate knowledge enables patients to understand disease transmission, treatment duration, potential side effects, and the importance of completing therapy (Surati et al., 2023). Empirical studies reported a significant association between patient knowledge and tuberculosis medication adherence using various statistical approaches (Maulana et al., 2024). Research findings from multiple Indonesian settings demonstrated significant correlations between knowledge levels and adherence outcomes among tuberculosis patients (Siburian et al., 2023). Other studies also confirmed that patients with higher knowledge scores were more likely to adhere to anti-tuberculosis medication regimens consistently (Hasina et al., 2023). Educational interventions implemented by healthcare workers were shown to improve adherence by enhancing patient understanding and motivation (Media Febriana et al., 2025). These findings indicate that patient knowledge remains a fundamental determinant of adherence behavior in tuberculosis treatment (Swarjana, 2022).

Family support plays a crucial role in tuberculosis medication adherence by providing emotional, instrumental, and motivational assistance to patients (Firmansyah, 2023). Supportive family environments encourage patients to maintain treatment schedules and cope with medication-related challenges (Husna, 2019). Several studies reported significant relationships between family support and adherence to tuberculosis treatment among patients in primary healthcare settings (Warjiman et al., 2022). Family members often act as treatment supervisors by reminding patients to take medications and accompanying them to health facilities (Aris et al., 2021). Research findings indicated strong correlations between family support and medication adherence, highlighting the protective role of family involvement (Aulia et al., 2023). Inadequate family support has been associated with increased risk of treatment interruption and poor clinical outcomes (Firmansyah, 2023). These findings emphasize that family-centered approaches are essential for improving adherence among tuberculosis patients (Warjiman et al., 2022).

Treatment supervisors, commonly referred to as PMO, represent a key component of the DOTS strategy in tuberculosis control programs (Hidayat & Gunawan, 2021). Treatment supervisors ensure that patients take their medications correctly and consistently throughout the treatment period (Anggiani et al., 2023). Empirical studies demonstrated significant associations between PMO involvement and improved tuberculosis medication adherence across various settings (Aris et al.,

2021). Both healthcare workers and trained family members can function effectively as treatment supervisors to support patient adherence (Anggiani et al., 2023). Evidence suggests that consistent supervision reduces treatment default rates and enhances treatment success (Felisa Ramayanti et al., 2024). Data from UPTD Puskesmas Kemalaraja reported substantial numbers of pulmonary tuberculosis cases, indicating the need for adherence-focused interventions at the facility level (Dinkes Provinsi Sumsel, 2023).

Therefore, this study aims to examine the relationship between patient knowledge, family support, and treatment supervisors with tuberculosis medication adherence in the working area of Puskesmas Kemalaraja.

RESEARCH METHODS

This study employed a quantitative observational design using a cross-sectional approach to examine the relationship between patient knowledge, family support, treatment supervisors, and tuberculosis medication adherence. A cross-sectional design was selected because it allows the simultaneous measurement of independent and dependent variables within a defined population at a single point in time, making it appropriate for identifying associations between variables without manipulating the study environment. This design is particularly suitable for public health research conducted in primary healthcare settings, where rapid assessment of behavioral and social determinants of treatment adherence is required. The correlational nature of the study enabled the analysis of statistical relationships among variables rather than causal inference. By applying this design, the study aimed to provide empirical evidence to inform adherence-focused interventions in tuberculosis control programs. The approach also ensured feasibility given the limited population size and the operational context of the primary healthcare facility.

The study was conducted in the working area of UPTD Puskesmas Kemalaraja, Ogan Komering Ulu Regency, Indonesia, which serves as a primary healthcare center responsible for tuberculosis management under the DOTS program. This location was selected due to the documented number of pulmonary tuberculosis cases and the availability of structured treatment supervision mechanisms. Data collection was carried out in July 2025, coinciding with the active treatment phase of registered tuberculosis patients. The chosen timeframe ensured that participants had sufficient exposure to treatment regimens, family involvement, and treatment supervision, which was essential for accurately assessing medication adherence. Conducting the study within a defined period minimized temporal bias and enhanced data consistency.

The study population consisted of all pulmonary tuberculosis patients registered at UPTD Puskesmas Kemalaraja from January to May 2025, totaling 34 individuals. Given the relatively small population size, the study applied a total sampling technique, in which all eligible patients were included as study participants. This sampling strategy was justified to maximize statistical power, reduce sampling bias, and ensure comprehensive representation of the target population. Inclusion criteria comprised patients diagnosed with pulmonary tuberculosis who were undergoing anti-tuberculosis treatment and were willing to participate in the study. Patients with incomplete treatment records or those unable to communicate effectively during interviews were excluded. The use of total sampling strengthened the internal validity of the study by minimizing selection bias.

Data collection was conducted through structured interviews and observation using standardized questionnaires. Primary data were obtained directly from participants through face-to-face interviews conducted by trained researchers, ensuring clarity and completeness of responses. Secondary data were collected from tuberculosis program records and annual reports at UPTD Puskesmas Kemalaraja to support contextual understanding of patient characteristics. The data collection procedure followed a systematic sequence, beginning with participant identification, explanation of study objectives, informed consent acquisition, and questionnaire administration.

Interviews were conducted in a private setting to ensure confidentiality and encourage honest responses. This procedure was designed to enhance data accuracy and reduce information bias.

The research instruments consisted of four structured questionnaires measuring tuberculosis medication adherence, patient knowledge, family support, and the role of treatment supervisors. The medication adherence questionnaire comprised six items with dichotomous response options, designed to assess consistency in medication intake. The patient knowledge questionnaire included ten items evaluating understanding of tuberculosis, transmission, and treatment. Family support was measured using a ten-item questionnaire with ordinal response options reflecting emotional and instrumental support. The treatment supervisor questionnaire contained eight items assessing supervision practices during treatment. All instruments underwent validity and reliability testing prior to data collection, ensuring that each tool accurately measured the intended constructs and produced consistent results.

Data processing involved several stages, including editing, coding, data entry, and data cleaning. Completed questionnaires were reviewed to ensure completeness and consistency before numerical coding was applied to transform responses into analyzable data. Data were entered into statistical software with careful verification to minimize entry errors. Cleaning procedures were conducted to identify and correct inconsistencies or missing values. This systematic data processing approach ensured data integrity and readiness for analysis.

Data analysis was performed using univariate and bivariate statistical methods. Univariate analysis was conducted to describe the distribution of each variable using frequencies and percentages. Bivariate analysis was applied to examine the relationships between independent variables and medication adherence using the Chi-square test at a significance level of 0.05. This statistical test was selected because the variables were measured on an ordinal scale and the study aimed to assess associations between categorical variables. The results of the analysis were presented in tabular and narrative forms to facilitate interpretation and comparison.

Ethical considerations were strictly observed throughout the study. Ethical approval was obtained from the appropriate institutional ethics committee prior to data collection. All participants received a clear explanation of the study objectives, procedures, potential risks, and benefits before providing informed consent. Participant confidentiality was maintained by anonymizing all data and restricting access to research records. Participants were informed of their right to withdraw from the study at any time without consequences to their treatment. These ethical measures ensured that the study complied with ethical standards for research involving human subjects.

RESULTS AND DISCUSSION

This section presents the results of the statistical analysis conducted to describe the characteristics of the study variables and to examine the relationships between patient knowledge, family support, treatment supervisors, and tuberculosis medication adherence. The results are organized into descriptive (univariate) and analytical (bivariate) analyses. Descriptive analysis summarizes the distribution of medication adherence, patient knowledge, family support, and treatment supervisors among pulmonary tuberculosis patients. Analytical analysis explores the associations between independent variables and medication adherence using inferential statistics. All results are presented in tabular form and followed by narrative interpretations to facilitate understanding. The findings provide empirical evidence relevant to tuberculosis treatment adherence in a primary healthcare setting

Table 1. Distribution of Medication Adherence, Patient Knowledge, Family Support, and Treatment Supervisors

Variables	Frequency (n)	Percentage (%)
Medication Adherence		
Low	6	17,6
Medium	16	47,1

High	12	35,3
Knowledge		
Low	7	20,6
Medium	18	52,9
High	9	26,5
Family Support		
Low	5	14,7
Medium	12	35,3
High	17	50
Treatment Supervisors		
Low	4	11,8
Medium	10	29,4
High	20	58,8

Table 1 shows the distribution of medication adherence and independent variables among pulmonary tuberculosis patients in the study area. Most patients demonstrated medium medication adherence, accounting for 47.1% of participants, while 35.3% showed high adherence, and 17.6% had low adherence. Regarding patient knowledge, the majority of respondents were categorized as having medium knowledge (52.9%), followed by high knowledge (26.5%) and low knowledge (20.6%). Family support was predominantly categorized as high, with half of the respondents (50.0%) reporting strong family involvement during treatment. Similarly, the role of treatment supervisors was mostly classified as high, accounting for 58.8% of participants. These findings indicate that favorable levels of knowledge, family support, and treatment supervision were common among patients, which may contribute to improved medication adherence.

Tabel 2. Relationship Between Patient Knowledge, Family Support, Treatment Supervisors, and Medication Adherence

Variables	Medication Adherence						Total		pvalue
	Low		Medium		High		n	%	
	n	%	n	%	n	%			
Knowledge									0,003
Low	4	57,1	1	14,3	2	28,6	7	100	
Medium	1	5,6	13	72,2	4	22,2	18	100	
High	1	11,1	2	22,2	6	66,7	9	100	
Family Support									0,022
Low	2	40	2	40	1	20	5	100	
Medium	3	25	8	66,7	1	8,3	12	100	
High	1	5,9	6	35,3	10	35,3	17	100	
Treatment Supervisors									0,039
Low	2	50	1	25	1	25	4	100	
Medium	3	30	6	60	1	10	10	100	
High	1	5	9	45	10	50	17	100	

Table 2 presents the bivariate analysis examining the relationships between patient knowledge, family support, treatment supervisors, and tuberculosis medication adherence. The analysis revealed a statistically significant association between patient knowledge and medication adherence ($p = 0.003$), indicating that higher knowledge levels were associated with better adherence outcomes. Patients with high knowledge showed the highest proportion of high adherence compared to those with low knowledge. Family support was also significantly associated with medication adherence ($p = 0.022$), with patients receiving high family support demonstrating higher adherence levels. Furthermore, the role of treatment supervisors showed a significant relationship with medication adherence ($p = 0.039$), where strong supervision was linked to improved adherence. These findings

suggest that patient knowledge, family support, and treatment supervision are important factors associated with tuberculosis medication adherence in the primary healthcare setting.

This study demonstrated that patient knowledge, family support, and treatment supervisors were significantly associated with tuberculosis medication adherence among pulmonary tuberculosis patients in a primary healthcare setting (Apriyanti & Novitry, 2024). The findings showed that most patients had moderate to high levels of medication adherence, indicating a relatively favorable treatment compliance pattern within the study population (Felisa Ramayanti et al., 2024). The results confirmed that higher levels of patient knowledge were accompanied by better adherence outcomes during tuberculosis treatment (Hasina et al., 2023). The analysis also revealed that strong family support was frequently present among patients with high medication adherence (Warjiman et al., 2022). Furthermore, the role of treatment supervisors appeared to be dominant in ensuring consistent medication intake throughout the treatment period (Anggiani et al., 2023). These findings align with the DOTS strategy, which emphasizes supervised treatment to improve adherence and treatment success (Kemenkes RI, 2022). Overall, the study findings highlight the multifactorial nature of tuberculosis medication adherence within community-based healthcare services (WHO, 2022).

Patient knowledge showed a statistically significant relationship with tuberculosis medication adherence in this study, indicating that informed patients were more likely to comply with treatment regimens (Maulana et al., 2024). Adequate knowledge enabled patients to understand the importance of completing therapy despite long treatment duration and potential side effects (Surati et al., 2023). Patients with higher knowledge levels demonstrated greater awareness of disease transmission and treatment consequences, which supported consistent medication intake (Siburian et al., 2023). Previous studies similarly reported that knowledge deficits contributed to treatment interruption and poor adherence behaviors among tuberculosis patients (Hasina et al., 2023). Educational exposure provided by healthcare workers increased patient confidence in managing treatment demands effectively (Swarjana, 2022). Knowledge acquisition also strengthened patients' perceived benefits of adherence and reduced misconceptions related to tuberculosis therapy (Wahdi & Puspitosari, 2021). Therefore, improving patient knowledge remains a critical strategy for enhancing tuberculosis medication adherence in primary healthcare settings (Maulana et al., 2024).

Family support emerged as a significant factor associated with medication adherence among pulmonary tuberculosis patients in this study (Warjiman et al., 2022). Supportive family environments provided emotional encouragement and practical assistance that facilitated regular medication intake (Husna, 2019). Family members often reminded patients to take medications and accompanied them to healthcare facilities, which reinforced adherence behavior (Aris et al., 2021). Patients receiving strong family support demonstrated higher motivation to complete treatment and cope with treatment-related challenges (Firmansyah, 2023). Previous research consistently reported that inadequate family support increased the likelihood of treatment default and non-adherence (Aulia et al., 2023). Family involvement also reduced feelings of stigma and isolation that commonly affect tuberculosis patients (Husna, 2019). These findings underscore the importance of integrating family-centered approaches into tuberculosis treatment programs to improve adherence outcomes (Warjiman et al., 2022).

The role of treatment supervisors was significantly associated with tuberculosis medication adherence in this study, highlighting the importance of structured supervision during treatment (Hidayat & Gunawan, 2021). Treatment supervisors ensured that patients consumed medications correctly and consistently according to prescribed schedules (Anggiani et al., 2023). Patients monitored by active supervisors showed lower rates of missed doses and treatment interruption (Aris et al., 2021). Both healthcare workers and trained family members effectively fulfilled the supervisory role, contributing to improved adherence outcomes (Felisa Ramayanti et al., 2024). Previous studies reported that inadequate supervision increased the risk of treatment failure and drug resistance (Media Febriana et al., 2025). Continuous supervision also strengthened patient accountability and reinforced adherence-related behaviors (Hidayat & Gunawan, 2021). Therefore, optimizing the role of treatment

supervisors remains essential for tuberculosis control at the primary healthcare level (Kemenkes RI, 2022).

The combined influence of patient knowledge, family support, and treatment supervision reflects the complex and interrelated determinants of tuberculosis medication adherence (Apriyanti & Novitry, 2024). Patients benefited most when educational, social, and supervisory factors were simultaneously present during treatment (Swarjana, 2022). Knowledge empowered patients to understand treatment requirements, while family support provided emotional stability and practical assistance (Firmansyah, 2023). Treatment supervisors complemented these factors by ensuring daily adherence and preventing missed doses (Anggiani et al., 2023). Studies have shown that single-factor interventions often produce limited effects on adherence compared to integrated approaches (Surati et al., 2023). Multidimensional strategies addressing behavioral, social, and structural factors are therefore more effective in sustaining long-term adherence (WHO, 2022). This study reinforces the need for comprehensive tuberculosis management strategies that incorporate patient education, family engagement, and active supervision (Kemenkes RI, 2022).

The findings of this study have important implications for tuberculosis control programs in primary healthcare settings (Dinkes Provinsi Sumsel, 2023). Healthcare providers should prioritize patient education as a routine component of tuberculosis treatment services (Surati et al., 2023). Programs should actively involve family members to strengthen social support systems for patients undergoing long-term treatment (Warjiman et al., 2022). Training and monitoring of treatment supervisors should be enhanced to ensure consistent and effective supervision throughout the treatment period (Hidayat & Gunawan, 2021). Strengthening coordination between healthcare workers, families, and supervisors can reduce treatment default and improve treatment success rates (Felisa Ramayanti et al., 2024). Local health authorities can use these findings to refine adherence monitoring strategies within DOTS implementation (Kemenkes RI, 2022). Ultimately, such efforts may contribute to reducing tuberculosis transmission and mortality at the community level.

CONCLUSION

This study concludes that patient knowledge, family support, and treatment supervisors are significantly associated with tuberculosis medication adherence among pulmonary tuberculosis patients in a primary healthcare setting. Higher levels of patient knowledge were linked to better understanding of treatment importance and greater consistency in medication intake. Strong family support contributed to improved adherence by providing emotional encouragement, practical assistance, and motivation throughout the treatment period. Active involvement of treatment supervisors played a crucial role in ensuring regular and correct medication consumption. These findings confirm that tuberculosis medication adherence is influenced by a combination of individual, social, and supervisory factors. The study highlights that adherence cannot be strengthened through single-factor interventions alone. Integrated strategies addressing these determinants are therefore essential for improving treatment outcomes.

From a public health perspective, the findings emphasize the importance of strengthening patient education, family engagement, and treatment supervision within tuberculosis control programs. Primary healthcare facilities should systematically incorporate structured education sessions, family-centered support approaches, and consistent supervision mechanisms into routine tuberculosis services. Enhancing coordination between healthcare workers, families, and treatment supervisors may reduce treatment default, prevent drug resistance, and improve treatment success rates. Although this study was limited by its cross-sectional design and small sample size, the results provide valuable evidence for adherence-focused interventions at the community level. Future research should apply longitudinal designs and include broader populations to further explore causal pathways influencing tuberculosis medication adherence. Overall, strengthening these key

determinants may contribute substantially to tuberculosis control efforts and improved patient outcomes.

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