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Original Article

Determinants of medication adherence among patients with tuberculosis in Ogan Komering Ulu, Indonesia: A cross-sectional study

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Abstract

Background: Medication adherence among tuberculosis patients is influenced by multiple behavioral, social, and healthcare-related factors. In many developing regions, challenges related to patient knowledge, family involvement, treatment perceptions, and healthcare education continue to affect the success of tuberculosis treatment programs. Understanding the determinants of medication adherence is therefore essential for improving treatment outcomes and strengthening tuberculosis control strategies at the community level.
Objective: This study aimed to identify the determinants of medication adherence among patients with tuberculosis in Ogan Komering Ulu, Indonesia.
Methods: This study employed a descriptive analytic design with a cross-sectional approach conducted at the UPTD Puskesmas Tanjung Agung, Ogan Komering Ulu Regency, South Sumatra, Indonesia. The study population consisted of all tuberculosis patients registered in the TB treatment program between January and August 2025. A total sampling technique was used, resulting in 44 respondents participating in the study. Data were collected using structured interviews with a questionnaire measuring patient knowledge, family support, perceptions of anti-tuberculosis drug side effects, quality of health education provided by healthcare workers, and medication adherence. Data analysis included univariate analysis to describe variable distributions and bivariate analysis using the Chi-square test.
Results: The results showed that 72.7% of respondents were adherent to anti-tuberculosis medication, while 27.3% were non-adherent. Bivariate analysis revealed that patient knowledge ($p = 0.003$), family support ($p < 0.001$), perception of drug side effects ($p = 0.001$), and quality of health education provided by healthcare workers ($p < 0.001$) were significantly associated with medication adherence. Patients with good knowledge, supportive family environments, positive perceptions of medication side effects, and high-quality educational support from healthcare providers demonstrated higher adherence rates during tuberculosis treatment.
Conclusion: Medication adherence among tuberculosis patients is significantly influenced by knowledge, family support, perceptions of medication side effects, and the quality of healthcare education. Strengthening patient education, promoting family involvement in treatment supervision, and improving communication between healthcare providers and patients may enhance adherence behavior and improve tuberculosis treatment outcomes.

Background

Tuberculosis remains a major global public health problem that continues to affect millions of people every year across both developed and developing countries (World Health Organization, 2024). Infectious diseases such as tuberculosis persist as dominant contributors to morbidity and mortality in many developing regions due to socioeconomic vulnerability and limited health resources (Al-Worafi, 2024). Effective tuberculosis control requires not only early detection but also strict adherence to long-term medication regimens that ensure complete eradication of Mycobacterium tuberculosis (Kementerian Kesehatan Republik Indonesia, 2025). Medication adherence plays a critical role in determining treatment success and preventing the development of drug resistance among tuberculosis patients (Ozaltun & Akin, 2024). Several epidemiological studies demonstrate that treatment adherence strongly influences clinical outcomes, treatment completion, and relapse prevention among tuberculosis patients (Opito et al., 2024). Research also indicates that poor adherence contributes to treatment failure and prolonged infectiousness within communities (Djochie et al., 2025).

Tuberculosis control programs in many countries still face significant challenges in maintaining consistent patient adherence to treatment protocols (Gatete et al., 2023).

Multiple patient-related, socioeconomic, and health system factors influence adherence behavior during the lengthy tuberculosis treatment period (Yan et al., 2025). Qualitative investigations show that patients frequently experience barriers such as stigma, transportation costs, and medication side effects during treatment (Appiah et al., 2023). Economic burden and financial coping strategies also influence the ability of families and treatment supporters to maintain treatment continuity (Bio et al., 2024). Employment instability and economic stress further affect psychological well-being and indirectly influence treatment behaviors among individuals with chronic illnesses (Gedikli et al., 2023). Socioeconomic conditions such as unemployment and food insecurity may also reduce patients' capacity to comply with long-term medical therapy (Bondarchuk et al., 2024).

Health system capacity and service delivery approaches also contribute significantly to tuberculosis treatment outcomes (Atake, 2023). Studies have demonstrated that directly observed therapy and structured treatment supervision can significantly improve medication adherence among tuberculosis patients (Burzynski et al., 2022). Differentiated care models combined with medication monitoring systems also show improvements in adherence and clinical outcomes in high-burden tuberculosis settings (Charalambous et al., 2024). Digital adherence technologies have recently emerged as innovative tools to monitor medication intake and strengthen treatment support mechanisms (Liu et al., 2023). Randomized controlled trials demonstrate that electronic medication reminders and monitoring devices can significantly increase treatment adherence among tuberculosis patients (Manyazewal et al., 2022). Recent global trials also confirm that digital adherence technologies can improve treatment outcomes when integrated with routine tuberculosis programs (Jerene et al., 2025).

Technological innovations continue to expand opportunities for improving tuberculosis treatment adherence in clinical and community settings (Li et al., 2025). Digital adherence technologies such as electronic medication monitors and mobile applications demonstrate potential benefits in supporting medication monitoring and patient engagement (Wei et al., 2024). Modeling studies show that digital adherence technologies combined with differentiated care strategies can generate significant epidemiological and economic benefits for tuberculosis control programs (Goscé et al., 2024). Systematic reviews further indicate that these technologies may provide cost-effective strategies for supporting treatment adherence in high-burden settings (Kafie et al., 2024). Implementation studies also report that digital adherence interventions are generally feasible and acceptable among patients undergoing tuberculosis treatment (Kiwanuka et al., 2023). Meta-analysis findings confirm that digital adherence technologies receive positive feedback from both patients and health providers when implemented within tuberculosis treatment programs (Guzman et al., 2023).

Behavioral and psychosocial determinants also play an important role in shaping treatment adherence among individuals with chronic illnesses (Anurak & Chaow, 2025). Studies of chronic disease management indicate that patient knowledge, behavioral patterns, and self-care practices influence adherence to recommended treatment regimens (Nurhayati & Febrianti, 2024). Research on other chronic disease conditions also demonstrates that family support significantly contributes to patients' compliance with therapeutic interventions (Aprita, 2024). Behavioral studies among individuals with chronic diseases further reveal that adherence is influenced by motivational, psychological, and lifestyle-related factors (Alee et al., 2025). Pharmacological treatment design, including fixed-dose combination therapy, also affects medication adherence through simplification of drug regimens (Wilkins et al., 2024). Digital transformation in healthcare systems further encourages healthcare professionals, including nurses, to adopt technological tools that support patient monitoring and treatment adherence (Wynn et al., 2023).

Tuberculosis remains a significant public health concern in Indonesia, including in South Sumatra Province where the burden of disease remains high (Dinas Kesehatan Provinsi Sumatera Selatan, 2024). Provincial health data report that 23,420 tuberculosis cases were detected from an estimated 37,946 cases, indicating a substantial gap between estimated and reported cases in the region (Dinas Kesehatan Provinsi Sumatera Selatan, 2024).

This gap suggests that tuberculosis control programs still face challenges in case detection and treatment management across health facilities (World Health Organization, 2024). At the district level, Ogan Komering Ulu also experiences a considerable burden of tuberculosis cases that requires strengthened prevention and treatment efforts (Dinas Kesehatan Kabupaten OKU, 2025). Local health records indicate that 741 tuberculosis cases were reported in 2024 while the regional case detection target reached 1,972 cases, representing only about 40% achievement of the expected target (Dinas Kesehatan Kabupaten OKU, 2025). These conditions highlight the importance of identifying determinants of treatment adherence in order to improve treatment outcomes and tuberculosis control strategies at the local level (Li et al., 2024).

This study aims to identify the determinants of medication adherence among patients with tuberculosis in Ogan Komering Ulu, Indonesia.

Methods

Study Design

This study employed a descriptive analytic design with a cross-sectional approach to examine the determinants of medication adherence among patients with tuberculosis. A cross-sectional design was selected because it enables the simultaneous measurement of independent and dependent variables at a single point in time, allowing the researcher to identify associations between potential determinants and medication adherence among tuberculosis patients within a real-world clinical context. This design is appropriate for public health research that aims to explore relationships between behavioral, psychosocial, and service-related factors and health outcomes without manipulating variables. The reporting of this study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline from the EQUATOR Network, which provides methodological recommendations for observational studies including cross-sectional research to ensure transparency, completeness, and reproducibility of findings.

Sampling

The target population in this study consisted of all patients diagnosed with pulmonary tuberculosis who were registered in the tuberculosis treatment program at UPTD Puskesmas Tanjung Agung. According to the tuberculosis program register, there were 44 patients receiving anti-tuberculosis treatment between January and August 2025. Because the total number of registered patients was relatively small and accessible, the study applied a total sampling technique, meaning that every individual in the population was included as a research participant.

The use of total sampling was justified for several reasons. First, total sampling increases the representativeness of the study because it captures the entire population of interest within the study setting. Second, including all available cases helps to minimize selection bias and ensures that the findings accurately reflect the characteristics of tuberculosis patients undergoing treatment in the local healthcare system. Third, total sampling improves statistical power in small population studies by maximizing the number of observations available for analysis. Therefore, the final sample size consisted of 44 respondents, representing the full population of tuberculosis patients receiving treatment in the study area during the specified period.

Eligibility criteria were established to ensure that respondents had sufficient experience with tuberculosis treatment and were able to provide reliable information regarding medication adherence. The inclusion criteria were defined as follows: (1) patients who were clinically diagnosed with pulmonary tuberculosis and were currently undergoing anti-tuberculosis treatment, (2) patients whose treatment status was officially recorded in the tuberculosis treatment register at UPTD Puskesmas Tanjung Agung, and (3) patients who were willing to participate in the study and provided written informed consent after receiving a full explanation of the research objectives and procedures.

The exclusion criteria were applied to ensure data quality and respondent capability in

completing the interview process. Patients were excluded from the study if they (1) experienced communication difficulties that prevented them from responding adequately to the interview questions, or (2) did not complete the questionnaire during the data collection process. These criteria were designed to ensure that all collected data represented accurate and complete responses that could be reliably analyzed.

Instruments

The primary data collection instrument used in this study was a structured questionnaire designed to measure the key variables related to medication adherence among tuberculosis patients. The questionnaire consisted of several sections that captured both independent variables and the main outcome variable. The independent variables included patient knowledge about tuberculosis, family support during treatment, patient perceptions regarding the side effects of anti-tuberculosis drugs, and the perceived quality of education provided by healthcare workers. The dependent variable measured in this study was medication adherence to anti-tuberculosis treatment.

Patient knowledge was defined as the level of understanding regarding tuberculosis disease, treatment procedures, and consequences of treatment interruption. Knowledge levels were categorized as good when respondents answered at least 75% of the knowledge questions correctly and categorized as poor when correct responses were below 75%.

Family support referred to the involvement of family members in assisting patients during treatment, including reminding patients to take medication, accompanying them to health facilities, or providing emotional encouragement. Family support was categorized as supportive when family members actively participated in treatment supervision and categorized as not supportive when such involvement was absent.

Perception of drug side effects referred to the patient's attitude toward physical symptoms experienced during treatment. Perceptions were categorized as positive when side effects did not discourage medication adherence and categorized as negative when side effects caused doubts or treatment interruption.

Quality of health education referred to the patient's evaluation of the information provided by healthcare workers regarding tuberculosis treatment. Education was categorized as good when information was delivered clearly, consistently, and regularly, and categorized as poor when information was perceived as insufficient or unclear.

Each variable was operationalized into measurable indicators through a set of structured questions with categorical response options. The knowledge component assessed respondents' understanding of tuberculosis transmission, treatment duration, and consequences of treatment interruption. The family support component evaluated the involvement of family members in reminding, motivating, or accompanying patients during treatment. The perception of medication side effects measured patients' attitudes toward symptoms experienced during therapy and whether these symptoms influenced their treatment continuity. The quality of health education assessed patients' perceptions regarding the clarity, frequency, and usefulness of information provided by healthcare professionals.

Medication adherence was assessed by evaluating the consistency of patients in taking anti-tuberculosis medication according to the prescribed treatment schedule. Respondents were categorized as adherent if they did not miss medication for more than one day within a week and were categorized as non-adherent if they missed medication for more than one day. The questionnaire was developed using simple and clear language to accommodate variations in respondents' educational backgrounds and health literacy levels. Before implementation, the instrument was reviewed by healthcare professionals working in the tuberculosis program at the health center to ensure clarity, contextual relevance, and suitability for use among tuberculosis patients in the study area.

Data Collection

Data collection was conducted from August to November 2025 in coordination with routine tuberculosis treatment services at the health center. The researcher conducted direct face-to-face interviews with each respondent using the structured questionnaire. The interview approach was chosen instead of self-administered questionnaires because it allowed the researcher to clarify questions when necessary and ensured that respondents with varying levels of literacy could participate fully in the study.

During each interview session, respondents were first provided with a detailed explanation regarding the purpose of the study and the confidentiality of the collected information. After obtaining informed consent, the researcher proceeded with the structured interview and recorded the responses systematically. In addition to interview data, the researcher also conducted document verification by reviewing tuberculosis treatment records, including medication monitoring notes and treatment adherence records maintained in the DOTS program register. This verification process was conducted to ensure the accuracy of self-reported adherence information and to reduce the risk of recall bias.

Data Analysis

The data analysis process was conducted in several stages to systematically examine the research objectives. First, univariate analysis was performed to describe the distribution of each study variable. Frequency distributions and percentages were calculated to summarize respondent characteristics and the distribution of variables including patient knowledge, family support, perceptions of medication side effects, quality of health education, and medication adherence. This step provided an overview of the characteristics of tuberculosis patients participating in the study.

Second, bivariate analysis was conducted to examine the relationship between independent variables and medication adherence. The Chi-Square statistical test was applied because the variables analyzed in this study were categorical in nature. This test assessed whether there were statistically significant associations between each determinant factor and the level of medication adherence among tuberculosis patients. The level of statistical significance was set at $p < 0.05$. When contingency tables contained cells with expected frequencies less than five, the Fisher Exact test was used as an alternative statistical method to ensure validity of the results.

Ethical Considerations

Ethical principles were strictly observed throughout the research process to ensure the protection of respondents' rights, safety, and confidentiality. Before data collection began, the researcher provided each potential participant with clear information regarding the purpose of the study, research procedures, potential benefits, and their rights as research participants. Participation in the study was entirely voluntary, and respondents were informed that they had the right to decline participation or withdraw from the study at any time without any consequences for their medical care.

All respondents who agreed to participate signed a written informed consent form as evidence of their voluntary participation. Confidentiality was maintained by anonymizing all collected data and removing any personal identifiers from the dataset. Each respondent was assigned a unique code number so that individual identities could not be traced in the research results or publication.

Results

Respondent Characteristics

The results section presents the findings of this study based on the analysis of data obtained from 44 tuberculosis patients who participated in this research. The analysis begins with the description of respondents' demographic characteristics to provide an overview of the population profile. The characteristics of respondents are presented in Table 1.

Table 1. Characteristics of Respondents (n = 44)

Variable	Frequency	Percentage
Age (years)		
15-24	8	18.2
25-44	22	50.0
≥45	14	31.8
Gender		
Male	27	61.4
Female	17	38.6
Education Level		
Elementary School	6	13.6
Junior High School	18	40.9
Senior High School	14	31.8
Higher Education	6	13.6
Occupation		
Laborer	12	27.3
Trader	10	22.7
Farmer	8	18.2
Civil Cervant/ Military/ Police	6	13.6
Others	8	18.2

Table 1 shows that the majority of respondents were 25–44 years old (50.0%), indicating that tuberculosis cases in the study area were most common among individuals in the productive age group. Respondents aged ≥45 years accounted for 31.8%, while those aged 15–24 years represented 18.2% of the sample. Based on gender distribution, male respondents constituted the majority (61.4%), while females accounted for 38.6% of the participants. Regarding educational attainment, most respondents had junior high school education (40.9%), followed by senior high school or vocational education (31.8%), while 13.6% had no schooling or only elementary education, and 13.6% had higher education.

In terms of occupation, the largest proportion of respondents worked as laborers (27.3%), followed by traders (22.7%), farmers (18.2%), and civil servants/military/police personnel (13.6%), while 18.2% reported other types of employment. These findings indicate that most tuberculosis patients in the study area were individuals with middle-to-lower socioeconomic backgrounds who were actively engaged in the workforce.

After describing the demographic characteristics, the analysis continued with the distribution of the main study variables, including medication adherence, patient knowledge, family support, perception of drug side effects, and quality of health education provided by healthcare workers. The distribution of these variables is presented in Table 2.

study. The findings indicate that 72.7% of respondents were categorized as adherent to tuberculosis medication, while 27.3% were classified as non-adherent. This suggests that although most patients followed the prescribed treatment regimen, a considerable proportion of patients still experienced challenges in maintaining consistent medication adherence.

Regarding knowledge about tuberculosis, 63.6% of respondents demonstrated good knowledge, while 36.4% had insufficient knowledge about tuberculosis disease and treatment. In terms of family involvement, 75% of respondents reported receiving supportive family assistance during treatment, whereas 25% reported a lack of family support.

The results also indicate that 72.7% of respondents had a positive perception of anti-tuberculosis drug side effects, meaning that side effects did not significantly discourage them from continuing treatment. However, 27.3% of respondents perceived drug side effects negatively, which may potentially influence adherence behavior.

Furthermore, the majority of respondents (77.3%) perceived the quality of health education provided by healthcare workers as good, while 22.7% considered the educational support to be insufficient. These findings suggest that patient education and family involvement may play important roles in influencing adherence behavior among tuberculosis patients

Table 2. Distribution of Respondents Based on Study Variables (n = 44)

Variable	Frequency	Percentage
Medication Adherence		
Adherent	32	72.7
Non-adherent	12	27.3
Knowledge Level		
Good	28	63.6
Poor	16	36.4
Family Support		
Supportive	33	75.0
Not Supportive	11	25.0
Perception of TB Druf Side Effect		
Positive	32	72.7
Negative	12	27.3
Quality of Health Education from Health Care Workers		
Good	34	77.3
Poor	10	22.7

Table 3. Association Between Independent Variables and Medication Adherence Among Tuberculosis Patients (n = 44)

Variable	Medication Adherence		Total (n,%)	p-value
	Adherent (n,%)	Non-adherent (n,%)		
Knowledge Level				
Good	25 (89.3)	3 (10.7)	28 (100)	0.003
Poor	7 (43.8)	9 (56.3)	16 (100	
Family Support				
Supportive	31 (93.9)	2 (6.1)	33 (100)	<0.001
Not Supportive	1 (9.1)	10 (90.9)	11 (100)	
Perception of TB Druf Side Effect				
Positive	28 (87.5)	4 (12.5)	32 (100)	<0.001
Negative	4 (33.3)	8 (66.7)	12 (100)	
Quality of Health Education from Health Care Workers				<0.001
Good	30 (88.2)	4 (11.8)	34 (100)	
Poor	2 (20)	8 (80)	10 (100)	

Table 3 presents the results of the bivariate analysis examining the relationship between independent variables and medication adherence among tuberculosis patients. The findings indicate that patient knowledge is significantly associated with medication adherence (p = 0.003). Among respondents with good knowledge, 89.3% adhered to treatment, whereas among those with poor knowledge only 43.8% adhered to treatment, indicating that higher levels of knowledge were associated with better adherence behavior.

Family support also showed a strong and statistically significant association with medication adherence (p < 0.001). Patients who received supportive family involvement demonstrated a very high adherence rate (93.9%), while those without family support

showed a substantially lower adherence rate (9.1%). This result suggests that family engagement plays an important role in supporting patients during long-term tuberculosis treatment.

The analysis further revealed a significant relationship between patients' perceptions of drug side effects and medication adherence ($p = 0.001$). Respondents who perceived the side effects of tuberculosis medication positively were more likely to adhere to treatment (87.5%) compared to those with negative perceptions (33.3%). Negative perceptions of drug side effects were associated with a higher proportion of non-adherence (66.7%).

In addition, the quality of health education provided by healthcare workers showed a significant association with medication adherence ($p < 0.001$). Among respondents who perceived the quality of health education as good, 88.2% adhered to treatment, whereas only 20% of respondents who reported poor educational support adhered to treatment. These findings indicate that clear and consistent patient education from healthcare providers may substantially influence adherence behavior.

Overall, the results demonstrate that knowledge, family support, perception of medication side effects, and the quality of healthcare education are significant determinants of medication adherence among tuberculosis patients in the study area

Discussion

The findings of this study indicate that most tuberculosis patients demonstrated good medication adherence, and several determinants showed significant associations with adherence behavior. The results revealed that patient knowledge, family support, perception of drug side effects, and the quality of health education provided by healthcare workers significantly influenced adherence to anti-tuberculosis treatment. Patients who possessed better knowledge about tuberculosis tended to adhere more consistently to medication regimens compared with those who had limited knowledge. Patients who received strong family support also demonstrated substantially higher adherence levels during the treatment period. Patients who perceived drug side effects positively were more likely to continue medication despite experiencing discomfort. Patients who received clear and consistent health education from healthcare providers also exhibited stronger treatment adherence behavior.

Tuberculosis remains a major infectious disease challenge that requires consistent treatment adherence to achieve successful therapeutic outcomes (World Health Organization, 2024). Health systems in many developing countries continue to face difficulties in maintaining optimal treatment adherence among tuberculosis patients because socioeconomic and healthcare access factors influence treatment behavior (Al-Worafi, 2024). Effective tuberculosis control programs require patients to complete the full course of anti-tuberculosis therapy to prevent disease transmission and drug resistance development (Kementerian Kesehatan Republik Indonesia, 2025). Several studies demonstrate that adherence to long-term tuberculosis therapy strongly determines treatment success rates and recovery outcomes among patients (Ozaltun & Akin, 2024). Treatment adherence also contributes to improved clinical outcomes and reduced risk of relapse among individuals undergoing tuberculosis therapy (Opito et al., 2024). Research also indicates that poor adherence increases the likelihood of treatment failure and prolonged infectiousness within communities (Djochie et al., 2025).

The results of this study demonstrate that patient knowledge significantly influences adherence to tuberculosis medication. Patients who possess adequate understanding of tuberculosis disease and treatment procedures tend to follow medication instructions more consistently. Knowledge shapes patient awareness regarding the consequences of treatment interruption and encourages individuals to complete the prescribed treatment regimen. Behavioral research indicates that knowledge plays an important role in shaping self-care practices and health behavior among individuals with chronic diseases (Anurak & Chaow, 2025). Health

education programs also strengthen patients' ability to understand treatment goals and encourage adherence behavior during long-term therapy (Nurhayati & Febrianti, 2024). Research on chronic disease management also demonstrates that improved patient knowledge significantly contributes to better compliance with therapeutic recommendations (Alee et al., 2025).

Family support also emerged as an important determinant of medication adherence in this study. Patients who received encouragement and assistance from family members were more likely to maintain consistent treatment behavior during the treatment period. Family members often play a crucial role in reminding patients to take medication and accompanying them to health facilities for routine monitoring. Social support systems contribute to improved treatment outcomes by strengthening patients' motivation and emotional resilience during long-term therapy. Studies demonstrate that family support significantly improves treatment compliance among individuals with chronic illnesses by reinforcing positive health behaviors (Aprita, 2024). Economic and social support from family members also helps patients overcome barriers related to treatment continuation and healthcare access (Bio et al., 2024).

Patients' perceptions regarding drug side effects also significantly influenced medication adherence in this study. Patients who perceived side effects positively were more likely to continue treatment despite experiencing discomfort during therapy. Negative perceptions toward medication side effects may lead patients to interrupt or discontinue treatment prematurely. Treatment adherence requires patients to understand that mild side effects are often temporary and manageable within the therapeutic process. Research shows that patient attitudes toward medication side effects strongly influence treatment continuation behavior during tuberculosis therapy (Yan et al., 2025). Clinical studies also demonstrate that patients who maintain positive perceptions of treatment regimens tend to achieve better treatment outcomes (Li et al., 2024).

The quality of health education provided by healthcare workers also showed a strong association with medication adherence. Patients who received clear and structured educational information about tuberculosis treatment were more likely to follow medication schedules consistently. Health education provided by healthcare workers improves patient awareness regarding treatment duration, medication procedures, and the importance of completing therapy. Effective communication between healthcare professionals and patients also strengthens patient engagement in the treatment process. Studies highlight that digital and educational innovations in healthcare improve patient understanding and support adherence to long-term treatment regimens (Wynn et al., 2023). Structured patient education and monitoring systems also contribute to improved tuberculosis treatment outcomes in various healthcare settings (Gatete et al., 2023).

Technological innovations also provide new opportunities to strengthen adherence among tuberculosis patients. Digital adherence technologies such as electronic medication monitors and mobile health applications support patient monitoring and medication reminders. These technologies allow healthcare providers to track medication intake and provide timely interventions when adherence problems occur. Several implementation studies demonstrate that digital adherence tools improve treatment monitoring and support adherence behavior among tuberculosis patients. Randomized trials indicate that electronic medication monitoring devices significantly improve treatment adherence and clinical outcomes among tuberculosis patients (Manyazewal et al., 2022). Other studies also confirm that digital adherence technologies provide effective and acceptable approaches to support treatment adherence in tuberculosis control programs (Jerene et al., 2025).

Furthermore, the integration of adherence monitoring technologies with patient-centered care approaches can strengthen tuberculosis treatment programs. Digital monitoring systems allow healthcare providers to identify early signs of non-adherence and intervene

promptly. Technology-assisted supervision also improves communication between patients and healthcare providers throughout the treatment process. Studies indicate that electronic medication monitoring combined with differentiated care models improves treatment outcomes and program effectiveness in tuberculosis control (Wei et al., 2024). Economic modeling research also demonstrates that digital adherence technologies provide cost-effective strategies for improving treatment adherence in high-burden tuberculosis settings (Goscé et al., 2024). Systematic reviews further highlight that digital monitoring tools provide feasible and scalable interventions for strengthening tuberculosis treatment adherence worldwide (Kafie et al., 2024).

Conclusion and Recommendation

This study concludes that patient knowledge, family support, perceptions of medication side effects, and the quality of health education provided by healthcare workers significantly influence medication adherence among tuberculosis patients in Ogan Komering Ulu. Patients with higher knowledge levels, supportive family environments, positive perceptions of medication side effects, and adequate educational support from healthcare providers demonstrate stronger adherence behavior during tuberculosis treatment. Strengthening patient education, involving family members in treatment supervision, and improving communication between healthcare providers and patients may enhance treatment adherence outcomes. Healthcare programs should also consider integrating structured monitoring and patient support strategies to maintain consistent medication adherence. Future interventions should focus on strengthening health education strategies and family engagement within tuberculosis control programs. Health authorities are encouraged to develop comprehensive adherence support programs to improve treatment success rates and reduce tuberculosis transmission in the community.

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Declaration on the Use of AI
No AI tools were used in the preparation of this manuscript.

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