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# Medication Adherence Associated with Tuberculosis Knowledge and Treatment Duration among Pulmonary Tuberculosis Patients at a TB DOTS Clinic in Jakarta, Indonesia

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**Abstract:** This study aimed to analyze medication adherence among pulmonary tuberculosis patients by examining the roles of patients' knowledge level and treatment duration within a TB DOTS clinical setting. **Methodology**: A quantitative analytic study with a cross-sectional design was conducted among 89 pulmonary tuberculosis patients at the TB DOTS Clinic of Pasar Minggu Regional General Hospital. Data were collected using structured questionnaires and clinical records. Univariate analysis described respondent characteristics, while bivariate analysis using the Chi-Square test examined the relationships between study variables. **Findings**: The results showed that most patients demonstrated poor knowledge of tuberculosis and associated with levels of medication adherence. A statistically significant relationship was found between patients' knowledge and medication adherence, indicating that higher knowledge levels were associated with better adherence. In contrast, treatment duration was not significantly associated with medication adherence. **Implications**: These findings highlight the importance of strengthening patient education within tuberculosis control programs, as improved knowledge may enhance adherence and support successful treatment outcomes. **Originality/Value**: This study provides empirical evidence from a real-world DOTS clinical setting by integrating patient knowledge and treatment duration in adherence analysis. The findings demonstrate that patient knowledge may play a more influential role than treatment duration in shaping medication adherence, offering a patient-centered contribution to tuberculosis care research.

**Keywords**: Tuberculosis, Patient Knowledge, Treatment Duration, Medication Adherence, DOTS Clinic.

## INTRODUCTION

Pulmonary tuberculosis (TB) remains a major public health problem because it is transmitted through airborne droplets, predominantly affects individuals in their most productive years, and requires prolonged multi-drug treatment regimens that are difficult to complete consistently. Globally, the World Health Organization (WHO) has set an ambitious target to reduce TB incidence by 90% between 2015 and 2035; however, the disease burden remains substantial. In 2024, an estimated 10.7 million people worldwide developed TB, and the disease continues to be one of the leading infectious causes of death,

with approximately 1.23 million deaths reported annually (Organization, 2024) ongoing therapeutic innovations, including recent phase-2 clinical trials of novel antibiotics such as sorfequiline that show promise in shortening treatment duration, TB remains a critical public health threat due to persistent challenges in diagnosis, treatment completion, and health system capacity, particularly in high-burden settings (Lay, 2025; Organization, 2024). This global situation is highly relevant to Indonesia, which ranks among the highest TB-burden countries worldwide, with an estimated 1.09 million TB cases and approximately 125,000 TB-related deaths each year (Indonesia, 2024).

Clinically, pulmonary TB is characterized by prolonged productive cough lasting two weeks or more, often accompanied by hemoptysis, dyspnea, fatigue, weight loss, loss of appetite, night sweats, malaise, and persistent fever, symptoms that frequently contribute to delayed health-seeking behavior and sustained community transmission. Globally, TB caused approximately 1.4 million deaths in 2019, with an estimated 10 million people affected and nearly 3 million cases remaining undiagnosed, highlighting significant gaps in detection and treatment coverage (Organization, 2024). National surveillance data further indicate that treatment outcomes have not yet achieved optimal targets; as of January 2023, only 74% of reported TB cases were verified, and treatment success reached 85%, falling short of the national target of 90% (Setiyowati et al., 2024). At the provincial level, DKI Jakarta continues to experience a rising trend in TB cases, with 28,540 drug-sensitive TB cases and 941 drug-resistant TB cases reported in 2022, reflecting persistent challenges related to urban density, transmission risk, and continuity of care (Kesehatan, 2019).

Recent literature published over the past seven years consistently highlights pulmonary tuberculosis (PTB) as a persistent global health challenge characterized by diagnostic complexity, prolonged treatment duration, and the growing burden of drug resistance. Advances in diagnostic approaches, including molecular and non-conventional techniques, have improved detection accuracy, particularly in cases with low bacterial load or suspected resistance, although sputum microscopy and culture remain widely used despite limitations in sensitivity and turnaround time (Basu, 2019; Palomino, 2005). From a therapeutic perspective, the standard six-month multidrug regimen remains effective for drug-sensitive PTB; however, its long duration and potential adverse effects contribute to treatment fatigue and adherence difficulties, especially in high-burden and resource-limited settings (Bonville & Domachowske, 2020; Mejbel et al., 2023). The increasing prevalence

of multidrug-resistant tuberculosis further reinforces the urgency of strengthening patient-centered treatment strategies and adherence monitoring (Lu et al., 2024).

Patient-related factors have been widely examined as determinants of medication adherence in pulmonary TB, with recent studies consistently demonstrating that knowledge plays a central role. Higher levels of knowledge regarding disease transmission, treatment duration, and prevention are significantly associated with better adherence to anti-tuberculosis drugs (Du et al., 2020; Ghozali & Murani, 2023). Conversely, inadequate core knowledge has been identified as a major risk factor for non-adherence, increasing the likelihood of treatment interruption and self-medication practices (You et al., 2020). Adherence behavior is also influenced by socio-demographic and psychosocial factors, including age, educational level, economic constraints, adverse drug reactions, treatment confidence, and social support, particularly during the continuation phase of therapy (Du et al., 2020; Jiang et al., 2023; Shinde, 2024). Recent evidence further emphasizes health literacy as a multidimensional construct that enhances adherence by improving patients' ability to access, understand, and apply TB-related information (Qomariyah & Piyabanditkul, 2023). Digital health tools and family-based support interventions have shown potential to improve adherence; however, their effectiveness remains uneven across populations and clinical contexts (Setiyowati et al., 2024; Sukartini et al., 2020).

Health system interventions remain a critical component of tuberculosis control, particularly through the implementation of the Directly Observed Treatment, Short-course (DOTS) program. Evidence from recent studies indicates that DOTS-managed treatment is associated with higher cure rates and improved medication adherence compared to self-administered therapy, with treatment success rates exceeding 85% in several settings (Lot et al., 2023; Tafess et al., 2016). Nevertheless, DOTS effectiveness is highly dependent on local health system capacity, and persistent challenges continue to be reported, including inadequate infrastructure, inconsistent drug supply, limited patient education, and weak coordination between public and private healthcare providers (Lot et al., 2023; Pethani et al., 2015). Psychosocial studies further suggest that while structured supervision under DOTS can enhance adherence, patients may still experience treatment fatigue, emotional distress, and psychological burden that undermine long-term compliance if not addressed through patient-centered and supportive health system approaches (Shiratani, 2019). Taken together, recent research indicates that patient knowledge, treatment duration, psychosocial dynamics, and health system performance have rarely been examined in an integrated

manner, revealing a critical gap that warrants further investigation in pulmonary tuberculosis care.

The purpose of this study is to address the existing gap in the literature by examining medication adherence among pulmonary tuberculosis patients through an integrated perspective that considers patient knowledge and treatment duration within a real-world DOTS clinic setting. Unlike previous studies that predominantly focus on single determinants, this research aims to provide a more comprehensive understanding of whether knowledge level and the length of treatment are associated with adherence behavior. By analyzing these factors together, the study seeks to identify key factors related to adherence that can inform patient-centered education strategies and adherence monitoring within tuberculosis control programs, thereby strengthening treatment effectiveness and improving overall clinical outcomes.

Based on the identified research problem, this study proposes that medication adherence among pulmonary tuberculosis patients is shaped by patients' level of knowledge regarding the disease and its therapy and may also vary across treatment duration. It is hypothesized that patients with higher knowledge about tuberculosis, including its transmission, treatment objectives, and consequences of non-adherence, are more likely to demonstrate higher levels of medication adherence. In addition, this study examines whether treatment duration ($\leq$ 6 months versus > 6–9 months) is associated with differences in medication adherence. These hypotheses will be empirically tested to provide a clearer explanation of adherence behavior among pulmonary tuberculosis patients within the DOTS clinical setting.

## RESEARCH METHOD

The unit of analysis in this study was individual pulmonary tuberculosis patients who were actively undergoing anti-tuberculosis treatment at the TB DOTS Clinic of Pasar Minggu Regional General Hospital. These individuals were selected as the focus of analysis because they directly experienced the treatment process and adherence demands associated with tuberculosis therapy. The variables analyzed at the individual level included patients' knowledge of tuberculosis, duration of treatment, and medication adherence.

This study employed a quantitative analytic design with a cross-sectional approach. The quantitative design was chosen to allow objective measurement of variables and

statistical testing of relationships between knowledge, treatment duration, and medication adherence. The cross-sectional approach was considered appropriate because all variables were measured simultaneously at one point in time, enabling the identification of associations without altering clinical conditions or treatment regimens. This design was suitable for evaluating adherence behavior within an operational TB DOTS clinical setting.

The study population consisted of all pulmonary tuberculosis patients registered and receiving treatment at the TB DOTS Clinic of Pasar Minggu Regional General Hospital during the data collection period. From this population, a total of 89 patients were included as study respondents. Purposive sampling was applied to select patients who met the inclusion criteria, namely being diagnosed with pulmonary tuberculosis, currently undergoing anti-tuberculosis treatment, and willing and able to complete the questionnaire independently. Patients with severe complications, cognitive impairments, or incomplete medical records were excluded to ensure data accuracy and reliability.

Data were collected using structured instruments that consisted of three main components. Patients' knowledge of tuberculosis was measured using a questionnaire assessing understanding of disease causes, symptoms, transmission, prevention, and treatment. TB Knowledge Instrument. Patients' tuberculosis knowledge was assessed using a structured questionnaire consisting of [X] items covering causes, symptoms, transmission, prevention, and treatment. Each correct response was scored 1 and incorrect/"do not know" responses were scored 0, yielding a total score range of 0–[X]. Knowledge level was categorized as adequate if the total score was ≥ [cut-off] (equivalent to ≥ [percentage]% correct answers) and poor if the score was < [cut-off]. Content validity was evaluated through expert judgment by [number] experts (e.g., TB clinician/public health/nursing), and the questionnaire demonstrated acceptable internal consistency with Cronbach's alpha = [α].

Treatment duration data were obtained from clinical records and categorized into less than six months and more than six to nine months. Treatment duration data were obtained from clinical records and categorized into two groups: ≤ 6 months and > 6–9 months. Medication adherence was assessed using the Morisky Medication Adherence Scale (MMAS), which categorizes adherence levels into low, examined together and high based on patients' medication-taking behavior. Prior to data collection, all instruments were reviewed for clarity and relevance, and ethical principles were applied through informed consent and confidentiality safeguards.

Data analysis was conducted in two stages. First, univariate analysis was performed to describe respondent characteristics, including age, sex, knowledge level, treatment duration, and medication adherence, using frequency and percentage distributions. Second, bivariate analysis was carried out to examine the relationships between knowledge and medication adherence, as well as between treatment duration and medication adherence. The Chi-Square test was used to analyze associations between categorical variables at a 95% confidence level. A p-value of less than 0.05 was considered statistically significant, allowing conclusions to be drawn regarding the acceptance or rejection of the research hypotheses.

## RESULT AND DISCUSSION

### Univariate Analysis

Data were collected from June 1 to June 30, 2025, at the TB DOTS Clinic of Pasar Minggu Regional General Hospital. A total of 89 pulmonary tuberculosis patients who met the inclusion criteria were included in the analysis. The univariate analysis presents respondent characteristics and the distribution of key study variables.

### Characteristics of Respondents

The age distribution of respondents is presented to describe the demographic profile of pulmonary tuberculosis patients included in this study. The classification was based on productive and non-productive age groups.

**Table 1.** Characteristics of Respondents Based on Age in 2025 (n = 89)

| Age Group | Frequency | Percentage (%) |
|---|---|---|
| Productive age (15–64 years) | 85 | 95.0 |
| Non-productive age (0–14 years) | 4 | 4.5 |
| **Total** | **89** | **100** |

Table 1 shows that the vast majority of respondents were within the productive age group. This indicates that pulmonary tuberculosis predominantly affects individuals who are actively engaged in economic and social activities, potentially influencing treatment adherence due to competing daily responsibilities.

The sex distribution of respondents is presented in Table 2 to provide an overview of gender composition among pulmonary tuberculosis patients.

**Table 2.** Characteristics of Respondents Based on Sex (n = 89)

| Sex | Frequency | Percentage (%) |
|---|---|---|
| Male | 40 | 44.9 |
| Female | 49 | 55.1 |
| **Total** | **89** | **100** |

As shown in Table 2, female respondents slightly outnumbered male respondents. However, the relatively balanced distribution suggests that pulmonary tuberculosis affects both sexes in a comparable proportion.

**Knowledge Level of Pulmonary Tuberculosis Patients**

Patients' knowledge regarding pulmonary tuberculosis was assessed to determine their understanding of disease transmission, treatment, and prevention. The distribution of knowledge levels among respondents is presented in Table 3.

**Table 3.** Knowledge Level of Pulmonary Tuberculosis Patients (n = 89)

| Knowledge Level | Frequency | Percentage (%) |
|---|---|---|
| Adequate | 25 | 28.1 |
| Poor | 64 | 71.9 |
| **Total** | **89** | **100** |

Table 3 demonstrates that most respondents had poor knowledge of pulmonary tuberculosis. This finding highlights a substantial gap in patient understanding, which may contribute to challenges in maintaining consistent medication adherence throughout the treatment period.

**Treatment Duration of Pulmonary Tuberculosis Patients**

The duration of anti-tuberculosis treatment among respondents was examined to describe their treatment phase at the time of data collection. The distribution of treatment duration is presented in Table 4.

**Table 4. Treatment Duration of Pulmonary Tuberculosis Patients (n = 89)**

| Treatment Duration | Frequency | Percentage (%) |
|---|---|---|
| > 6–9 months | 48 | 53.9 |
| ≤ 6 months | 41 | 46.1 |
| **Total** | **89** | **100** |

Table 4 shows that more than half of the respondents had been on treatment for > 6–9 months (48/89; 53.9%). This indicates that a large proportion of patients were in the continuation phase of therapy, a period often associated with declining motivation and increased risk of treatment fatigue.

**Medication Adherence**

Medication adherence was measured to assess patients' compliance with anti-tuberculosis drug regimens. The distribution of adherence levels is shown in Table 5.

**Table 5.** Medication Adherence of Pulmonary Tuberculosis Patients (n = 89)

| Adherence Level | Frequency | Percentage (%) |
|---|---|---|
| Low | 18 | 20.2 |
| Moderate | 44 | 49.4 |
| High | 27 | 30.3 |
| **Total** | **89** | **100** |

As presented in Table 5, moderate adherence was the most frequently observed category among respondents, followed by high adherence. Nevertheless, one-fifth of patients demonstrated low adherence, indicating a persistent risk for suboptimal treatment outcomes.

**Bivariate Analysis**

**Relationship Between Knowledge Level and Medication Adherence**

To examine the association between patients' knowledge level and medication adherence, a Chi-Square test was performed. The cross-tabulation results are presented in Table 6.

**Table 6.** Relationship Between Knowledge Level and Medication Adherence Among Pulmonary Tuberculosis Patients (n = 89)

| Knowledge Level | Low Adherence n (%) | Moderate Adherence n (%) | High Adherence n (%) | Total n (%) | P-value |
|---|---|---|---|---|---|
| Adequate | 2 (11.1) | 7 (15.9) | 16 (64.0) | 25 (100) | |
| Poor | 18 (28.1) | 35 (54.7) | 11 (17.2) | 64 (100) | **0.001** |
| **Total** | **18 (20.2)** | **44 (49.4)** | **27 (30.3)** | **89 (100)** | |

Table 6, above shows that out of 89 respondents, those with poor knowledge and moderate adherence totaled 35 respondents (54.7%). Based on the Chi-Square statistical

test at a 95% confidence level, it was found that there is a relationship between knowledge and medication adherence among Pulmonary Tuberculosis patients at the TB DOTS Clinic of Pasar Minggu Regional General Hospital in 2025 (p value 0.001 < 0.05). $H_0$ is rejected and $H_a$ is accepted.

**Relationship Between Treatment Duration and Medication Adherence**

The relationship between treatment duration and medication adherence was analyzed to determine whether longer treatment periods were associated with decreased adherence. The results are presented in Table 7.

**Table 7.** Relationship Between Treatment Duration and Medication Adherence Among Pulmonary Tuberculosis Patients (n = 89)

| Treatment Duration | Low Adherence n (%) | Moderate Adherence n (%) | High Adherence n (%) | Total n (%) | P-value |
|---|---|---|---|---|---|
| > 6–9 months | 10 (20.8) | 25 (52.1) | 13 (27.1) | 48 (100) | |
| ≤ 6 months | 8 (19.5) | 19 (46.3) | 14 (34.1) | 41 (100) | **0.767** |
| **Total** | **18 (20.2)** | **44 (49.4)** | **27 (30.3)** | **89 (100)** | |

Table 7 shows that the dominant treatment duration category was > 6–9 months, with moderate adherence observed in 25 respondents (52.1%). The Chi-Square test indicated no significant association between treatment duration and medication adherence (p = 0.767).

**Discussion**

This study explored medication adherence among pulmonary tuberculosis patients at the TB DOTS Clinic of Pasar Minggu Regional General Hospital by examining the roles of patients' knowledge level and treatment duration. The findings indicate that most respondents were within the productive age group and that medication adherence was predominantly at a moderate level. A statistically significant association was identified between patients' knowledge and medication adherence, whereas treatment duration was not significantly associated with adherence. These results suggest that adherence behavior in pulmonary tuberculosis is more strongly influenced by patients' cognitive and behavioral factors than by the length of treatment alone.

The significant relationship between knowledge and medication adherence may be explained by the fundamental role of knowledge in shaping health-related behavior. Patients who have a sufficient understanding of tuberculosis, including its transmission, treatment objectives, and the consequences of non-adherence, are more likely to perceive treatment as essential and to maintain consistent medication intake. This awareness fosters motivation, strengthens self-efficacy, and supports long-term commitment to therapy, even in the presence of side effects or competing daily responsibilities. In contrast, patients with limited knowledge may underestimate the importance of completing treatment, particularly when clinical symptoms begin to improve, leading to inconsistent adherence or premature discontinuation of medication.

These findings are consistent with previous studies that have demonstrated a strong association between knowledge and adherence to anti-tuberculosis treatment. Research conducted by Siburian (2023) and Dwiningrum (2021) similarly reported that patients with higher levels of knowledge were more likely to adhere to treatment regimens. The present study reinforces these findings within a real-world DOTS clinical setting, highlighting knowledge as a key determinant of adherence behavior. In contrast, the absence of a significant relationship between treatment duration and adherence differs from studies that have reported declining adherence during prolonged therapy due to treatment fatigue. However, this result aligns with evidence from DOTS-based studies showing that structured supervision and patient education can examined concurrently the negative effects of long treatment duration on adherence. The novelty of this study lies in its integrated assessment of tuberculosis knowledge and treatment duration in relation to medication adherence within a real-world DOTS clinical setting. Unlike previous studies that primarily examined individual determinants of adherence, this study evaluates knowledge level and treatment duration concurrently and provides empirical evidence that knowledge is significantly associated with adherence, while treatment duration is not significantly associated with adherence in this setting.

Beyond statistical associations, the findings carry important implications for tuberculosis control efforts. The results suggest that medication adherence should be understood not merely as a function of treatment length but as a behavior influenced by patients' understanding, perceptions, and engagement with their treatment. From a public health perspective, this underscores the importance of health literacy as a central component of tuberculosis management. Enhancing patient knowledge has the potential to

improve adherence, reduce the risk of treatment failure and drug resistance, and ultimately decrease disease transmission within the community.

Despite the implementation of the DOTS strategy, the finding that a large proportion of patients demonstrated poor knowledge indicates potential gaps in the delivery or effectiveness of patient education. This highlights a functional challenge within current health service practices, where education may be provided in a limited or inconsistent manner. At the same time, the lack of association between treatment duration and adherence suggests that prolonged therapy does not inevitably lead to non-adherence, particularly when patients receive adequate support. However, it may also reflect the influence of unmeasured factors, such as family support, psychological resilience, or patient–provider communication, which could sustain adherence over time.

Taken together, these findings emphasize the need for a more patient-centered approach to tuberculosis care. Strengthening education should be a continuous process throughout the treatment course rather than a one-time intervention at diagnosis. Regular reinforcement of key messages, tailored to patients' literacy levels and individual circumstances, may help sustain adherence, especially during the continuation phase of treatment. In addition, integrating routine assessments of patient knowledge into clinical practice could enable healthcare providers to identify individuals at higher risk of non-adherence and to implement targeted interventions. From a policy perspective, investing in training healthcare workers in effective communication and education strategies represents a practical and sustainable approach to improving adherence and strengthening the overall effectiveness of tuberculosis control programs.

## CONCLUSION

This study demonstrates that medication adherence among pulmonary tuberculosis patients is more strongly influenced by patients' level of knowledge than by the duration of treatment. The key finding indicates that adequate knowledge regarding tuberculosis particularly in relation to disease transmission, treatment objectives, and the consequence of non-adherence is significantly associated with higher levels of medication adherence. In contrast, treatment duration alone does not show a significant relationship with adherence, suggesting that prolonged therapy does not necessarily lead to non-compliance when patients possess sufficient understanding and engagement with their treatment.

The main scientific contribution of this study lies in its integrated examination of patient knowledge and treatment duration within a real-world DOTS clinical setting. Unlike previous studies that predominantly focused on single determinants of adherence, this research provides empirical evidence that cognitive and educational factors may play a more dominant role than treatment length in shaping adherence behavior. By highlighting knowledge as a key determinant of adherence independent of treatment duration, this study contributes to a more patient-centered perspective in tuberculosis care and supports the strengthening of educational interventions as a core component of tuberculosis control programs.

Despite its contributions, this study has several limitations that should be acknowledged. The cross-sectional design limits the ability to infer causal relationships between variables, and the use of self-reported measures may introduce recall or social desirability bias. Additionally, other potential factors influencing adherence, such as family support, psychological conditions, and health system characteristics, were not examined. Future research is recommended to employ longitudinal or mixed-methods designs to explore causal pathways and to include a broader range of psychosocial and system-level variables to develop more comprehensive strategies for improving medication adherence among pulmonary tuberculosis patients.

## REFERENCES

Basu, I. (2019). The past, present and future of tuberculosis diagnostics techniques. *New Zealand Journal of Medical Laboratory Science*, *73*(2), 36–44. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85070208984&partnerID=40&md5=527911ae165034c4a2d7f59627413a31

Bonville, C., & Domachowske, J. (2020). Tuberculosis. In *Vaccines: A Clinical Overview and Practical Guide* (pp. 363–372). https://doi.org/10.1007/978-3-030-58414-6_31

Du, L. et al. (2020). Determinants of medication adherence for pulmonary tuberculosis patients during continuation phase in Dalian, Northeast China. *Patient Preference and Adherence*, *14*, 1119–1128. https://doi.org/10.2147/PPA.S243734

Ghozali, M. T., & Murani, C. T. (2023). Relationship between knowledge and medication adherence among patients with tuberculosis: a cross-sectional survey. *Bali Medical Journal*, *12*(1), 158–163. https://doi.org/10.15562/bmj.v12i1.3826

Indonesia, K. K. R. (2024). *Tuberkulosis di Indonesia: Situasi terkini dan tantangan pengendalian*. Kementerian Kesehatan Republik Indonesia. https://www.kemkes.go.id

Jiang, Y. et al. (2023). Status quo and influencing factors of medication compliance in

young newly diagnosed pulmonary tuberculosis patients. *Chinese Journal of Practical Nursing*, *39*(18), 1388–1395. https://doi.org/10.3760/cma.j.cn211501-20220527-01666

Kesehatan, B. P. dan P. (2019). *Laporan Provinsi DKI Jakarta: Riset Kesehatan Dasar (Riskesdas) 2018*. Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan Republik Indonesia.

Lay, K. (2025). New drug could be a breakthrough in treatment for killer TB, trial suggests. *The Guardian*. https://www.theguardian.com/global-development/2025/nov/19/new-drug-could-be-breakthrough-killer-tb-tuberculosis-sorfequiline

Lot, S. B. et al. (2023). Treatment Outcome Monitoring by Using Sputum Conversion Rate of Tuberculosis Patients in Pkd Kinta, Malaysia. *Malaysian Journal of Medicine and Health Sciences*, *19*(Supplement 9), 11–16. https://doi.org/10.47836/MJMHS.19.S9.3

Lu, P.-X. et al. (2024). Pathogenic Mechanism of Drug-Resistant Pulmonary Tuberculosis and Its Diagnosis. In *Diagnostic Imaging of Drug Resistant Pulmonary Tuberculosis* (pp. 29–38). https://doi.org/10.1007/978-981-99-8339-1_4

Mejbel, F. A. H. et al. (2023). Pulmonary tuberculosis risks and challenges. *E3S Web of Conferences*, *381*. https://doi.org/10.1051/e3sconf/202338101101

Organization, W. H. (2024). *Global Tuberculosis Report 2024*. World Health Organization. https://www.who.int/publications/i/item/9789240092463

Palomino, J. C. (2005). Nonconventional and new methods in the diagnosis of tuberculosis: Feasibility and applicability in the field. *European Respiratory Journal*, *26*(2), 339–350. https://doi.org/10.1183/09031936.05.00050305

Pethani, A. et al. (2015). Engaging general practitioners in public-private mix tuberculosis dots program in an urban area in Pakistan: Need for context-specific approach. *Asia-Pacific Journal of Public Health*, *27*(2), NP984–NP992. https://doi.org/10.1177/1010539513483828

Qomariyah, F. N., & Piyabanditkul, L. (2023). Association between Health Literacy and Medication Adherence among Pulmonary Tuberculosis Patients Using Four Domains of the Integrated Health Literacy Model in Jember Regency, Indonesia. *Journal of Health Literacy*, *8*(3), 9–21. https://doi.org/10.22038/jhl.2023.71529.1408

Setiyowati, E. et al. (2024). Monitoring medication adherence using smart digital technology in patients with pulmonary tuberculosis. *Healthcare in Low-Resource Settings*, *12*(3). https://doi.org/10.4081/hls.2024.11995

Shinde, A. M. (2024). Socio-demographic factors & adherence of newly diagnosed pulmonary tuberculosis patients to the newly introduced daily regimen: A hospital survey based follow up study. *Indian Journal of Tuberculosis*, *71*, S250–S257. https://doi.org/10.1016/j.ijtb.2024.03.011

Shiratani, K. N. (2019). Psychological changes and associated factors among patients with tuberculosis who received directly observed treatment short-course in metropolitan areas of Japan: Quantitative and qualitative perspectives. *BMC Public Health*, *19*(1). https://doi.org/10.1186/s12889-019-8001-9

Sukartini, T. et al. (2020). Family Health Tasks Implementation and Medication Adherence of Pulmonary Tuberculosis Patients: A Correlational Study. *Jurnal Ners*, *15*(1), 49–

58. https://doi.org/10.20473/jn.v15i1.8175

Tafess, K. et al. (2016). Determining treatment outcome of smear-positive pulmonary tuberculosis cases in Afar Regional State, Ethiopia: A retrospective facility based study. *International Journal of Mycobacteriology*, *5*(2), 164–169. https://doi.org/10.1016/j.ijmyco.2016.02.003

You, Y.-Y. et al. (2020). Analysis of influencing factors of medication adherence among 120 newly diagnosed patients with multi-drug resistant pulmonary tuberculosis. *Chinese Journal of Antituberculosis*, *42*(3), 249–254. https://doi.org/10.3969/j.issn.1000-6621.2020.03.013