

Medication Adherence and Associated Determinants Among Patients in Liquiça Municipality, Timor-Leste: A Correlational Qualitative Study Using the Morisky Medication Adherence Scale (MMAS)

Joaquim Gregorio de Carvalho¹, Joaquim Pinto², Eduardo Crisogono Gaio³, Natália Pereira⁴,
Eugenia de Carvalho⁵, ⁵José Dionisio Ximenes

⁶Eugenia Carvalho de Araújo, Heru Sutopo⁷

¹Public Health Sciences, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

^{2,3,4,5,6}Universidade Nacional Timor Lorosa'e Timor-Leste

⁷Univeritas Cendikia Abditama, Indonesia

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Abstract

Background: Tuberculosis (TB) continues to represent a major global public health concern. In 2023, TB was estimated to have caused approximately 1.25 million deaths worldwide, including around 161,000 deaths among individuals living with HIV. Moreover, drug-resistant TB, particularly multidrug-resistant TB (MDR-TB), remains a persistent public health emergency and poses a substantial threat to global health security. According to the *Global TB Report 2023*, an estimated 3.8 million people in the WHO South-East Asia Region initiated tuberculosis treatment in 2023. This represents a notable increase compared with 2020, a period during which TB services in the region were substantially disrupted by the COVID-19 pandemic. The *Global TB Report* further emphasizes that tuberculosis remains a major public health concern in Timor-Leste. Data from the *WHO Global TB Report 2024*, released on October 29, indicate that Timor-Leste recorded 6,171 newly reported TB cases in 2023, representing a substantial increase compared with previous years.

Objective: To examine medication adherence using the Morisky Medication Adherence Scale (MMAS) in relation to the side effects of Directly Observed Treatment, Short-course (DOTS) in Liquiça Municipality.

Research method: Mehods: This study was conducted in Liquiça Municipality using a quantitative correlational research design. A total of 100 participants were selected through stratified total sampling. Data were collected using structured questionnaires. The relationship between medication adherence and DOTS-related side effects was analyzed using Kendall's tau-b correlation test. Statistical significance was set at $p < 0.05$.

Results: The study findings indicated that 32 participants (32%) demonstrated sufficient medication adherence, while 68 participants (68%) exhibited good adherence; none were

classified as having low adherence. In terms of DOTS-related side effects, 85 participants (85%) reported minimal side effects, 14 participants (14%) experienced moderate side effects, and 1 participant (1%) reported severe side effects. Bivariate analysis using Kendall's tau-b revealed a statistically significant relationship between medication adherence and DOTS-related side effects ($p = 0.002, < 0.05$). The negative correlation coefficient of -0.305 suggested a weak inverse association between the variables.

Conclusion: There is a relationship between patient adherence to medication and the side effects of DOTS.

Keywords: Adherence, DOTS medication, Tuberculosis,

Introduction

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* that can involve almost any organ system, although it primarily affects the lungs. Successful management of TB requires a standardized treatment regimen lasting a minimum of six months. Insufficient treatment duration or poor adherence to therapy often results in treatment failure, prolonged recovery, and a higher risk of mortality (Elizabeth et al., 2024).

Individuals with weakened immune systems including those living with HIV, malnourished persons, individuals with diabetes, and tobacco users face a heightened risk of developing active TB. In 2023, TB cases attributable to specific risk factors were estimated at approximately 960,000 for malnutrition, 750,000 for alcohol use disorders, 700,000 for smoking, 610,000 for HIV infection, and 380,000 for diabetes. The emergence of drug-resistant TB often results from the improper use of non-TB medications, including inappropriate prescribing practices, substandard drug quality, or patient non-adherence leading to premature discontinuation of treatment. By 2023, it is estimated that around 40% of TB cases were drug-resistant (WHO, 2024).

Adherence is a key behavioral concept, describing the extent to which individuals follow instructions, comply with established guidelines, or act in accordance with authority directives (Yunitasari *et al.*, 2023). In the context of patient behavior, adherence refers to the extent to which individuals follow prescribed recommendations or protocols, including therapeutic interventions, dietary plans, exercise routines, and scheduled medical appointments (Haryanto et al., 2023).

Research findings suggest that medication adherence is a critical determinant of recovery from TB. Adherence is influenced by multiple factors, including patient age, occupation, supervision during medication intake, type and dosage of medication, guidance provided by healthcare professionals, and patients' knowledge and attitudes toward treatment (Yunianti et al., 2024).

The effectiveness of pulmonary TB treatment largely depends on patients' consistent adherence to prescribed anti-tuberculosis medications. Adherence can be improved through the support of a

medication supervisor, who plays a key role in ensuring correct medication intake. The involvement of a swallowing supervisor is particularly significant, as it helps patients achieve optimal treatment outcomes. Additionally, collaboration between healthcare providers and family members or caregivers assisting patients during therapy constitutes an important factor in determining treatment success (Marvia et al., 2024).

According to the latest TB treatment guidelines, the World Health Organization (WHO) highlights that supervision alone may not be sufficient to achieve optimal treatment outcomes. Integrating supervision with additional adherence-enhancing interventions such as social support, digital health technologies, and patient education and counseling has been shown to substantially improve treatment success. These comprehensive strategies are effective in promoting adherence and enhancing overall therapeutic outcomes (Ministério da Saúde., 2020) available on <https://iris.who.int/server/api/core/bitstreams/9d964c67-24d0-4075-8bd4-e92ba2b415f2/content>.

TB management is generally the responsibility of healthcare professionals assigned to supervise the implementation of TB control programs at healthcare facilities or within designated regions (Yunitasari *et al.*, 2023). Family health promoters are essential in improving the knowledge, attitudes, and health behaviors of both families and the broader community. They may be healthcare professionals or trained community members who have received specialized education to facilitate health promotion activities (Ministerio da Saúde , 2016) available on <https://platform.who.int/docs/default-source/mca-documents/policy-documents/report/tls-cc-62-02-report-2016-tet-rel-anual-jan-dezembro-2016.pdf> .

The responsibilities of TB officers and family health promoters include monitoring and supporting patients' adherence to medication schedules, providing guidance on the timing of sputum examinations, delivering relevant TB-related information to patients and their families, and correcting misconceptions about the disease. For example, they educate patients that TB is an infectious disease transmitted between individuals, not a genetic or malignant condition, and that it can be effectively cured through consistent treatment. They also provide information on potential treatment side effects, the consequences of non-adherence, and other critical aspects of TB management (Yunitasari *et al.*, 2023).

According to the WHO, an estimated 10.8 million people worldwide were affected by TB in 2023, including 6.0 million men, 3.6 million women, and 1.3 million children. TB occurs across all countries and age groups and is recognized as both a preventable and curable disease (WHO, 2024).

The 2023 Global TB Report reveals that approximately 3.8 million individuals in the Southeast Asian region initiated TB treatment through WHO supported programs in 2023. This marks an increase of nearly 1.3 million cases compared to 2020, a growth partially attributed to disruptions caused by the COVID-19 pandemic. The report also highlights a reduction in the estimated

number of TB-related deaths, which fell to 583,000 in 2023 after rising to 763,000 in 2021 (WHO, 2024).

TB has become a major public health concern in Timor-Leste. According to the WHO Global TB Report 2024, released on 29 October, Timor-Leste reported 6,171 TB cases in 2023, indicating a substantial disease burden. The increase in reported cases is partly attributed to strengthened surveillance and the broader implementation of diagnostic systems in countries with a high TB incidence. Notably, the number of TB cases in Timor-Leste rose from 5,370 in 2022, reflecting a continued upward trend (WHO, 2024).

According to TB surveillance data from the Liquiça Municipal Health Office, a total of 329 TB cases were identified in 2023. In 2024, the number of reported TB cases in Liquiça Municipality increased to 346. The distribution of cases across the municipality's health centers is as follows:

Table1: Data from the TB surveillance system of the Liquiça Municipal Health Office

No	Chs	Male	%	Female	%	Total	%
1	Bazartete	90	26%	67	19%	157	45,4%
2	Liquiça Vila	59	17%	49	14%	108	31,2%
3	Maubara	54	16%	27	8%	81	23,4%
Total		203	59%	143	41%	346	100%

TB remains a major global public health concern, with an estimated 10.8 million people affected worldwide in 2023, and a growing burden in high-risk populations, including individuals with HIV, malnutrition, diabetes, and tobacco use. Despite the availability of effective treatment regimens, poor adherence, substandard medications, and prolonged treatment durations contribute to treatment failure and the emergence of drug-resistant TB, which now accounts for approximately 40% of global cases. Studies have highlighted that adherence is a multidimensional behavior influenced by patient knowledge, attitudes, supervision, social support, and healthcare guidance. The integration of healthcare professionals and family health promoters in patient monitoring and education has been shown to enhance adherence and treatment outcomes, yet challenges persist in ensuring optimal compliance, particularly in resource limited settings like Timor-Leste, where TB incidence continues to rise.

In Timor-Leste, the increasing number of TB cases were 6,171 in 2023, with continued growth in municipalities such as Liquiça Municipality demonstrates an urgent need for targeted interventions to improve treatment adherence and outcomes. Understanding the factors that influence patients' adherence to TB therapy, including the roles of supervision, social support, and health education, is essential to reduce treatment failure, prevent drug resistance, and ultimately decrease TB morbidity and mortality. Research in this context is particularly critical for informing evidence-based strategies that strengthen local TB control programs, optimize the involvement of family health promoters, and support patients in managing long-term therapy in line with WHO recommendations.

Materials And Methods

A quantitative correlational design was employed in this study to explore the associations between the variables of interest (Yunitasari *et al.*, 2023). The study population comprised patients with pulmonary TB who sought treatment at community health centers in Liquiça Municipality and met the established inclusion criteria. Between December 2024 and May 2025, the number of TB patients attending each health center was as follows: 35 at Liquiça Vila Community Health Center, 48 at Bazartete Community Health Center, and 51 at Maubara Community Health Center, resulting in a total of 134 patients during this period. A sample size of 100 was selected for the study using a stratified random sampling technique. Data were collected through structured questionnaires, and bivariate analysis was conducted using Kendall's tau-b to examine the correlations between variables.

Results

Descriptive Analysis

1. Medication Adherence

Table 2. Frequency Distribution Based on Medication Adherence

No	Medication Obedience	Frequency	%
1	Low Adherence	0	0
2	Sufficient	32	32
3	Highly Adherent	68	68
Total		100	100

Based on Table 2, the analysis of medication adherence using the Morisky Medication Adherence Scale revealed that 32 respondents (32% of the sample) were classified as having “Sufficient” adherence, while 68 respondents (68%) were categorized as “Highly Adherent.” No respondents were identified in the “Low Adherence” category.

2. Role of family health promoters

Table3. Frequency Distribution Based on the Role of Family Health Promoters in Liquiça Municipality

No	Role of family health promoter	Frequency	%
1	unsupport	87	87
2	Minimal Support	2	2
3	Maximum support	11	11
Total		100	100%

Based on Table 3, the analysis of the role of family health promoters revealed that 87 respondents (87%) received “No Support,” 2 respondents (2%) received “Minimal Support,” and 11 respondents (11%) received “Maximum Support.”

3. Role of TB Agents

Table 4. Frequency Distribution Based on the Role of TB Agents in Liquiça Municipality

No	Role of TB agents	Frequency	%
1	No Support	11	11
2	Minimal Support	2	2
3	Maximum support	87	87
Total		100	100%

Based on Table 4, the results regarding the role of tuberculosis (TB) agents are as follows: 'No Support' – 11 respondents (11%), 'Minimal Support' – 2 respondents (2%), and 'Maximum Support' – 87 respondents (87%).

4. Side Effects of DOTS Therapy

Table 5. Frequency Distribution Based on DOTS Side Effects of DOTS Therapy in Liquiça Municipality

No	DOTS Side Effects	Frequency	%
1	Low effect	85	85
2	High side effects	14	14
3	Severe side effects	1	1
Total		100	100%

Based on Table 4.5, the analysis of DOTS therapy side effects showed that 85 participants (85%) experienced “Low Effect,” 14 participants (14%) experienced “High Side Effects,” and 1 participant (1%) experienced “Severe Side Effects.”

Bivariate Analysis

Table 6. Relationship Between Medication Adherence Using the Morisky Medication Adherence Scale and DOTS Side Effects Therapy in Liquiça Municipality.

Correlation	Variables	Coefficient Correlation	Sig. (2-Tailed)
Kendall's tau_b	medication adherence DOTS side effects	-0.305	0.002

Based on the results of Kendall's tau-b analysis presented in Table 4.16, the two-tailed significance value was 0.002, which is below the 0.05 threshold. This indicates a statistically significant relationship between medication adherence and DOTS side effects. Consequently, the alternative hypothesis (H1) is accepted, and the null hypothesis (H0) is rejected. The negative correlation coefficient of -0.305 suggests that patients tend to maintain high medication adherence even when experiencing fewer side effects. The strength of this relationship is considered weak.

Table 7. Relationship Between the Role of Family Health Promoters and the Side Effects of DOTS Therapy in Liquiça Municipality

	Variables	Coefficient Correlation	Sig. (2-Tailed)
<i>T-Kendall's</i>	Role of family Health promoter DOTS side effects	0.954	0.006

Based on the results of Kendall's tau-b analysis presented in Table 4.17, the two-tailed significance value was 0.954, which exceeds the 0.05 threshold. This indicates that there is no statistically significant relationship between the role of family health promoters and the side effects of DOTS therapy. Accordingly, the alternative hypothesis (H2) is rejected, and the null hypothesis (H0) is accepted.

Table 8. Relationship Between the Role of TB Agents and DOTS Side Effects Therapy in Liquiça Municipality

Correlation	Variables	Coefisient Correlation	Sig. (2-Tailed)
<i>Kendall's tau_b</i>	Role of TB agents DOTS side effects	-0.006	0.954

Based on the results of Kendall's tau-b analysis presented in Table 4.18, the two-tailed significance value was 0.954, exceeding the 0.05 threshold. This indicates that there is no statistically significant relationship between the role of TB agents and the side effects of DOTS therapy. Consequently, the alternative hypothesis (H3) is rejected, and the null hypothesis (H0) is accepted.

Discussion

1. Medication Adherence

Based on data collected from 100 respondents at the Health Service of Liquiça Municipality, analysis using the Morisky Medication Adherence Scale indicated that 32 participants (32%) exhibited “Sufficient Adherence,” while 68 participants (68%) were classified as having “High Adherence,” with only a small proportion of respondents identified as non-adherent.

In comparison, a previous study titled “*Correlation of Medication Supervision Service with Medication Adherence for Pulmonary Tuberculosis Patients*” reported that 49 patients (61.3%) demonstrated proper adherence, 19.13% were partially compliant, and 22 patients (27.5%) did not adhere to their medication regimen. That study also found a statistically significant relationship between supervisor performance and medication adherence among pulmonary tuberculosis patients ($p < 0.001$), with a strong correlation coefficient of $r = 0.704$ (Yunitasari *et al.*, 2023).

In conclusion, adherence to medication is essential for improving patient outcomes. The results of this study indicated that the majority of respondents were fully adherent to their prescribed tuberculosis treatment, compared to those who were moderately adherent or non-adherent, among a total of 100 participants. Similarly, the previous study by Yunitasari *et al.* (2023) reported a significant positive relationship between supervision and medication adherence, further highlighting the importance of proper guidance and support in promoting consistent treatment adherence among pulmonary tuberculosis patients (Yunitasari *et al.*, 2023). The study also found that most patients adhered to their medication regimen, suggesting that they generally follow treatment instructions with the intention and hope of achieving recovery from TB.

2. Role of family health promoters

Based on Table 3, the analysis of the role of family health promoters revealed that 11 respondents (11%) reported receiving no support in their medication adherence, 2 respondents (2%) reported minimal support, and the majority, 87 respondents (87%), indicated that family health promoters provided maximum support.

According to previous research, 58 patients (72.5%) reported good supervisor performance, while 22 patients (27.5%) reported poor performance. The study found a significant relationship between supervisor performance and medication adherence among pulmonary tuberculosis patients ($p < 0.001$), with a strong correlation coefficient of $r = 0.704$ (Yunitasari *et al.*, 2023).

In contrast, at the study site, most family health promoters appeared largely inactive and did not effectively fulfill their roles. They failed to establish agreements on medication administration locations, set treatment schedules, encourage patients to adhere to their medication regimens, explain the benefits of continuous therapy, or provide health education regarding TB prevention. Based on the results obtained by the researcher regarding the role of family health promoters, the majority of respondents from Maubara and Bazartete Community Health Centers reported

receiving little or no support from family health promoters. In contrast, they received substantial support from the official TB program under Klibur Domin, which facilitated medicine distribution and provided health education on TB prevention. Additionally, some families actively assisted TB agents by helping distribute medications, arranging treatment schedules, and coordinating therapy.

3. Role of TB agents

Based on Table 4, the analysis of the role of TB agents revealed that 11 respondents (11%) reported receiving no support, 2 respondents (2%) reported minimal support, and the majority, 87 respondents (87%), received maximum support.

According to previous research on the *“Correlation of Medication Supervision Service with Medication Adherence for Pulmonary Tuberculosis Patients,”* 58 patients (72.5%) reported experiencing good supervisor performance, while 22 patients (27.5%) reported poor performance. The study identified a significant relationship between supervisor performance and medication adherence among pulmonary tuberculosis patients ($p < 0.001$), with a strong correlation coefficient of $r = 0.704$ (Yunitasari *et al.*, 2023).

In conclusion, the study results indicate that most respondents from Maubara and Bazartete Community Health Centers received maximum support from TB agents. However, some respondents from Liquiça Vila Community Health Center reported that TB agents in their area occasionally did not fully support medication distribution, schedule planning, or treatment coordination. Instead, these respondents relied more on the official program under the Love Club, which provided additional assistance and support.

4. DOTS Side Effects Therapy

Based on the survey conducted among respondents in Liquiça Municipality in 2025, the overall findings were generally positive. The study involved 100 participants, and the analysis revealed that the side effects of DOTS therapy were predominantly low. Specifically, 85 respondents (85%) reported experiencing low side effects, 14 respondents (14%) experienced high side effects therapy, and only 1 respondent (1%) reported severe side effects therapy.

According to the study, the majority of respondents experienced minimal side effects therapy and demonstrated high levels of treatment adherence (Andira *et al.*, 2024).

Thus, based on the results obtained by the researcher, it can be concluded that the majority of respondents in Liquiça Municipality experience minimal side effects from DOTS therapy (Andira *et al.*, 2024).

5. The relationship between medication-taking adherence and DOTS side effects therapy

The analysis of the relationship between medication adherence and DOTS side effects using Kendall's tau-b correlation coefficient revealed a two-tailed p-value of 0.002, which is below the 0.05 threshold. This indicates a statistically significant relationship between medication adherence and DOTS side effects. Consequently, the alternative hypothesis (H1) is accepted, and the null hypothesis (H0) is rejected. The negative correlation coefficient of -0.306 suggests that patients generally maintain high adherence to their medication even when experiencing fewer side effects. The strength of this relationship is considered weak.

The study results indicated a significant relationship between the side effects of anti-tuberculosis drugs (ATDs) and the level of treatment adherence among pulmonary tuberculosis patients in the Tambang Community Health Center service area, with a p-value of 0.003 ($p < 0.05$) (Syafiq et al., 2024). Based on these two studies, it can be concluded that there is a significant relationship between medication adherence and the side effects of DOTS therapy.

Thus, it can be summarized that the findings of this study regarding the relationship between medication adherence and DOTS side effects therapy in Liquiça Municipality are consistent with previous research (Syafiq et al., 2024), which similarly reported a significant relationship between medication adherence and DOTS side effects therapy.

6. Relationship between family health promoting role and DOTS side effects therapy

Based on the results of Kendall's tau-b analysis presented in the table above, the two-tailed p-value was 0.954, which exceeds the 0.05 significance level. This indicates that there is no statistically significant relationship between the role of family health promoters and the side effects of DOTS therapy. Consequently, the alternative hypothesis (H2) is rejected, and the null hypothesis (H0) is accepted.

According to the National Treatment Program in Timor-Leste, DOTS is a critical component of the tuberculosis treatment strategy. All regimens containing Rifampicin must be administered under direct observation. The WHO defines DOTS as any process in which a designated individual observes a patient taking their medication in real time. These treatment observers are not required to be healthcare professionals; they can include friends, family members, or other community members serving as treatment supporters or promoters roles that already exist in each village. DOTS is most effective when delivered at home or within the community, with the support of trained providers or health services (Ministério da Saúde., 2020) available on <https://iris.who.int/server/api/core/bitstreams/9d964c67-24d0-4075-8bd4-e92ba2b415f2/content>. The results indicate that there is no significant relationship between the role of family health promoters and the side effects of DOTS therapy.

7. The relationship between the role of TB agents and DOTS side effects therapy

Based on the results of Kendall's tau-b analysis presented in the table above, the two-tailed p-value was 0.954, which exceeds the 0.05 significance level. This indicates that there is no statistically significant relationship between the role of TB agents and the side effects of DOTS therapy. Consequently, the alternative hypothesis (H3) is rejected, and the null hypothesis (H0) is accepted.

According to the latest tuberculosis treatment guidelines, the WHO emphasizes that treatment supervision alone is insufficient to achieve optimal TB treatment outcomes. Combining supervision with additional adherence-support interventions such as social support, digital health tools, and patient education has been shown to significantly improve treatment outcomes and enhance patient adherence (Ministério da Saúde., 2020) available on <https://iris.who.int/server/api/core/bitstreams/9d964c67-24d0-4075-8bd4-e92ba2b415f2/content>. In conclusion, the study results indicate that there is no significant relationship between the role of TB agents and the side effects of DOTS therapy.

Conclusion

Based on the research findings, several conclusions can be drawn. First, analysis using the Morisky Medication Adherence Scale indicated that patients generally adhered to their prescribed medication regimen. Second, the role of family health promoters was largely ineffective in supporting medication adherence. Third, TB agents generally provided substantial support to patients. Fourth, most patients experienced side effects associated with DOTS therapy. Fifth, there was a significant relationship between medication adherence and DOTS side effects. However, no significant relationship was found between the role of family health promoters and DOTS side effects, nor between the role of TB agents and DOTS side effects.

The results of this study suggest that identifying factors influencing medication adherence through the Morisky Medication Adherence Scale (MMAS) can guide the design of effective interventions to enhance tuberculosis treatment outcomes in Liquiça Municipality.

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