



TUBERCULOSIS KNOWLEDGE AND BARRIERS TO DIRECTLY OBSERVED TREATMENT AMONG PATIENTS IN TURISCAI, TIMOR-LESTE

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Abstract :

This study examined tuberculosis knowledge and treatment-related practices among patients with bacteriologically positive tuberculosis at Centro de Saúde Turiscai, Manufahi Municipality, Timor-Leste. The study included 30 patients registered in 2010 and employed a descriptive research design. Data were collected through observation, interviews, questionnaires, and tuberculosis program records and analyzed using descriptive frequency distributions. The findings showed that 80% of respondents strongly agreed with the statement assessing their knowledge of tuberculosis. Furthermore, 90% strongly agreed with the statements concerning tuberculosis transmission and the benefits and side effects of anti-tuberculosis medication, while 93% strongly agreed with the statement concerning treatment duration. However, understanding tuberculosis and its treatment did not necessarily translate into participation in directly observed treatment (DOT). Approximately 57% of respondents reported difficulties attending DOT, mainly because of distance to health facilities and transportation costs. These findings highlight the importance of addressing geographical and economic barriers alongside patient education to support treatment participation. Improving healthcare accessibility and strengthening patient follow-up may help address these challenges. The findings should be interpreted cautiously because the study involved a small, facility-based sample and relied on descriptive data collected in 2010.

Keywords : Tuberculosis, Tuberculosis Knowledge, Treatment Adherence, Directly Observed Treatment, Timor-Leste

INTRODUCTION

Tuberculosis (TB) remains a major public health concern despite the availability of effective diagnostic and treatment strategies. The persistence of TB is associated not only with the transmission of *Mycobacterium tuberculosis*, but also with challenges in accessing healthcare, maintaining treatment continuity, and ensuring that patients understand the disease and the importance of completing therapy. The World Health Organization (WHO) continues to identify TB prevention, diagnosis, treatment, and patient-centred care as central priorities in global TB control (World Health Organization, 2020, 2021, 2022, 2023, 2024, 2025a). The End TB Strategy further emphasizes that improving treatment outcomes requires coordinated action addressing health-service delivery and the broader circumstances affecting people with TB (World Health Organization, 2015). Consequently, examining patients' knowledge and treatment-related experiences remains important for understanding how TB programmes operate in specific local settings.

Knowledge about TB may influence how patients understand the disease,



recognize the importance of treatment, and respond to health professionals' instructions. However, knowledge alone does not necessarily guarantee consistent treatment adherence because patients' decisions are also shaped by social circumstances, financial resources, accessibility of healthcare facilities, and the quality of support received during treatment. A systematic review by Craciun et al. (2023) identified differences in TB-related knowledge, attitudes, and practices across low- and middle-income settings, highlighting the relevance of education and access to reliable information. Similarly, Pengpid & Peltzer (2019), using data from the 2016 Timor-Leste Demographic and Health Survey, examined population-level knowledge, attitudes, and practices related to TB. Their findings provide a relevant national context for understanding TB awareness in Timor-Leste, although population-level findings cannot be assumed to represent the experiences of patients receiving treatment in a particular health centre. Research in other settings has also examined demographic and socioeconomic differences in TB-related knowledge and practices, indicating that these dimensions should be considered when interpreting patients' understanding of the disease (Ma et al., 2024).

Treatment adherence is another essential component of TB care because treatment requires patients to follow prescribed medication schedules and maintain contact with healthcare services over time. Evidence syntheses have examined different strategies for improving adherence and their relationship with treatment outcomes (Alipanah et al., 2018; Müller et al., 2018; Pradipta et al., 2020). Educational and psychological interventions have also been investigated as approaches to addressing barriers to treatment adherence, including through interventions informed by the Health Belief Model (Tola et al., 2016). More recent reviews have examined interventions in Southeast Asia and the potential contribution of communication strategies, digital adherence technologies, and other forms of treatment support (Davis et al., 2024; Meira et al., 2025; Santosa et al., 2025; Siti Rahmah et al., 2025). These studies demonstrate that adherence is a multidimensional issue rather than a matter of patient knowledge alone. Nevertheless, findings from different countries and treatment programmes must be interpreted in relation to their specific healthcare and socioeconomic contexts.

Directly observed treatment (DOT) has historically been used in TB programmes to support treatment monitoring and encourage continuity of medication use. However, the implementation of treatment observation may create practical demands for both patients and healthcare providers. Research has examined the effectiveness and limitations of adherence interventions, while newer approaches have explored communication-based support and digital technologies as alternatives or complements to conventional observation (Alipanah et al., 2018; Davis et al., 2024; Meira et al., 2025; Santosa et al., 2025). WHO treatment guidelines and operational guidance provide a contemporary framework for patient-centred TB treatment and care (World Health Organization, 2025b, 2025c). These current recommendations should not, however, be interpreted as a description of the procedures used in every health facility in earlier periods. For a study based on data collected in 2010, DOT and

treatment follow-up must therefore be discussed in relation to the practices documented in the original research rather than retrospectively assuming that current recommendations were implemented at that time.

The local context is particularly important in Timor-Leste, where previous research has documented barriers and enabling factors associated with TB treatment adherence. Martins et al. (2008) reported that treatment completion was influenced by patients' knowledge, economic circumstances, geographical remoteness, cultural practices, and the availability of incentives. These findings demonstrate why adherence should be understood in relation to the practical conditions under which patients access treatment. Similar concerns have been examined in research on barriers to TB services at community health centres, including the organization and accessibility of services (Pradipta et al., 2022), as well as in qualitative research involving populations facing different social and service-related challenges (Sanauddin et al., 2025). The broader literature on long-term treatment adherence also emphasizes that maintaining treatment involves more than receiving medical instructions and may require sustained support from healthcare providers and the surrounding social environment (World Health Organization, 2003). A review protocol comparing adherence in high- and low-TB-burden settings further illustrates continuing research interest in how contextual differences shape adherence, although a protocol itself does not provide completed review findings (Eyawo et al., 2025).

Against this background, the present study examines tuberculosis knowledge and treatment adherence among patients with bacteriologically positive TB registered at Centro Saude Turiscai, Timor-Leste, in 2010. Using the descriptive data documented in the original study, the article focuses on patients' reported knowledge of TB, their understanding of treatment and follow-up, and the treatment-related practices and barriers described in the source material. The study is intended to provide a historical, facility-level account that can be considered alongside subsequent research on TB knowledge and adherence in Timor-Leste and other settings. It does not seek to establish causal relationships or estimate current conditions in Turiscai. By documenting these patient experiences, the article contributes contextual evidence for understanding the relationship between TB knowledge, treatment follow-up, and the practical implementation of treatment support in a local healthcare setting.

RESEARCH METHOD

Study Design and Setting

This study employed a descriptive research design to examine tuberculosis knowledge and treatment-related practices among patients with bacteriologically positive tuberculosis registered at Centro Saude Turiscai, Turiscai, Manufahi Municipality, Timor-Leste, in 2010. The study focused on patients' understanding of tuberculosis, their knowledge of treatment and follow-up, and their experiences with directly observed treatment (DOT). A descriptive approach was appropriate for documenting the characteristics and responses reported in the original study without introducing causal claims or

relationships that were not examined in the source data. Previous research in Timor-Leste has also used descriptive population-based and qualitative approaches to investigate TB knowledge and treatment adherence, although those studies involved different populations, periods, and research objectives (Martins et al., 2008; Pengpid & Peltzer, 2019).

Study Population and Data Sources

The study included 30 patients with bacteriologically positive tuberculosis who were registered at Centro Saude Turiscai in 2010. The analysis was based on the original study records and the information reported in the source document. Data collection involved observation, interviews, questionnaires, and secondary information from tuberculosis programme records. These sources were used to describe patients' knowledge of tuberculosis, their understanding of treatment benefits and follow-up, and reported practices associated with treatment monitoring. The study population should be interpreted as a facility-based group of registered patients rather than a representative sample of all people with tuberculosis in Turiscai or Timor-Leste. This distinction is important when comparing the findings with population-based research, such as the Timor-Leste Demographic and Health Survey analysis conducted by Pengpid and Peltzer (2019).

Study Variables and Analytical Focus

The principal analytical dimensions were tuberculosis knowledge, understanding of treatment and follow-up, and treatment-related practices associated with DOT. Tuberculosis knowledge concerned patients' reported awareness and understanding of the disease and its treatment. Treatment-related practices concerned the reported experience of attending follow-up appointments and participating in treatment observation. The analysis also considered barriers described in the original study, particularly distance to health services and transportation costs. These dimensions were selected to reflect the scope of the original data and to facilitate comparison with research examining knowledge, adherence, and barriers to tuberculosis care (Craciun et al., 2023; Martins et al., 2008; Pradipta et al., 2020).

The study did not establish a validated composite knowledge score or a standardized adherence scale in the information available from the original report. Therefore, the variables were interpreted descriptively according to the categories and responses documented in the source material. The study also did not assess socioeconomic determinants through a multivariable statistical model. Accordingly, the term *treatment adherence* in this article refers to the treatment-related practices reported in the original study and should not be interpreted as a formally validated measure of medication adherence.

Data Collection and Analysis

Data were obtained through observation, interviews, questionnaires, and secondary tuberculosis programme records, as reported in the original study. The information was summarized using descriptive frequency analysis. Reported responses were organized into categories and expressed as frequencies or percentages where the source document provided sufficient information. The

analysis focused on describing the distribution of patients' responses rather than testing hypotheses or estimating associations between variables. No new patient-level data, inferential statistical tests, or causal models were introduced for this article.

The collected data were analyzed using descriptive frequency analysis. Responses concerning tuberculosis knowledge, DOT implementation, and treatment follow-up were summarized as frequencies and percentages. The analysis focused on describing respondents' knowledge of tuberculosis, their understanding of treatment and follow-up, and their reported experiences in participating in DOT. Barriers to treatment participation, particularly distance to health facilities and transportation costs, were also considered in interpreting the findings. The results were presented descriptively to provide an overview of respondents' knowledge and treatment-related practices.

Ethical Considerations and Methodological Limitations

The available documentation does not provide sufficient information to verify formal ethics committee approval, informed-consent procedures, or authorization for the use of the original data in this article. These details could not be confirmed from the available records and should therefore not be assumed. The study is limited by its small facility-based sample, descriptive design, and reliance on data collected in 2010. Consequently, the findings cannot establish causal relationships, represent the current tuberculosis situation in Turiscai, or be generalized to all patients in Timor-Leste. Interpretation is further constrained by inconsistencies in the original figures and the absence of documented standardized measures of tuberculosis knowledge and treatment adherence.

The methodological interpretation is informed by previous research on TB knowledge, treatment adherence, and support interventions, including systematic reviews and studies addressing educational, communication-based, and digital approaches (Craciun et al., 2023; Meira et al., 2025; Santosa et al., 2025; Tola et al., 2015). These publications provide context for interpreting the subject matter, but they are not treated as sources of data for the present study. Current WHO treatment guidelines and operational guidance are likewise used only as contemporary context, not as evidence of the specific procedures applied at Centro Saude Turiscai in 2010 (World Health Organization, 2025b, 2025c).

FINDINGS AND DISCUSSION

Respondent Characteristics

The study included 30 patients with bacteriologically positive tuberculosis registered at Centro Saude Turiscai, Manufahi Municipality, Timor-Leste, in 2010. Of these respondents, 17 were male and 13 were female. The largest age group was 35–44 years, comprising nine respondents (30%), followed by those aged 45–54 years, comprising eight respondents (26%). Respondents aged 25–34 years and 55–64 years each accounted for five respondents (17%), while three respondents (10%) were aged 15–24 years. No respondents were older than 65

years.

Table 1: Age and sex distribution of respondents

Age group (years)	Male	Female	Total, n	Percentage
15-24	2	1	3	10%
25-34	3	2	5	17%
35-44	5	4	9	30%
45-54	4	4	8	26%
55-64	3	2	5	17%
Over 65	0	0	0	0%
Total	17	13	30	100%

Source: Primary research data, 2010.

These findings describe the characteristics of patients registered at the health centre during the study period and should not be interpreted as representing the demographic distribution of all people with tuberculosis in Timor-Leste. The predominance of respondents aged 35–44 years indicates that this age group accounted for the largest proportion of patients in the study population. However, the descriptive design does not establish whether age or sex was associated with treatment adherence. The findings therefore provide contextual information about the respondents rather than evidence of demographic determinants. Previous research on tuberculosis knowledge and practices has similarly emphasized the importance of considering population characteristics and local context when interpreting disease-related knowledge (Ma et al., 2024; Pengpid & Peltzer, 2019).

Knowledge of Tuberculosis

The study assessed respondents' understanding of tuberculosis symptoms and the possibility that the disease could affect people regardless of age, sex, or socioeconomic status. As presented in Table 2, 24 respondents (80%) strongly agreed with the statement assessing tuberculosis knowledge, while three (10%) agreed. Two respondents (7%) were uncertain, and one (3%) disagreed. Overall, 27 respondents (90%) expressed agreement or strong agreement with the statement.

Table 2: Respondents' reported knowledge of tuberculosis

Response category	Respondents, n	Percentage
Strongly agree	24	80%
Agree	3	10%
Uncertain	2	7%
Disagree	1	3%
Total	30	100%

Source: Primary research data, 2010.

The results indicate that most respondents reported awareness of tuberculosis-related symptoms and susceptibility. Nevertheless, the response categories do not constitute a validated knowledge score and should not be interpreted as evidence of comprehensive understanding of tuberculosis transmission, prevention, diagnosis, or treatment. This distinction is important

when comparing the findings with broader studies of tuberculosis knowledge, attitudes, and practices, which may use different questions and measurement approaches (Craciun et al., 2023; Pengpid & Peltzer, 2019).

Healthcare-worker education may have contributed to respondents' awareness, particularly through explanations about tuberculosis symptoms, prevention, and treatment after diagnosis. However, the study did not isolate the effects of health education or measure changes in knowledge before and after counselling. Therefore, the findings support the importance of patient education as part of tuberculosis care but do not establish that education directly improved treatment adherence. Previous intervention research has examined educational and psychological support as potential approaches to improving treatment adherence, emphasizing the need to evaluate interventions within their specific contexts (Alipanah et al., 2018; Tola et al., 2016).

Knowledge of DOT and Treatment Follow-up

Respondents were also asked about the importance of directly observed treatment (DOT) and treatment follow-up. As shown in Table 3, 18 respondents (60%) strongly agreed with the statement concerning DOT and follow-up, two (7%) agreed, three (10%) were uncertain, and seven (23%) disagreed. Although most respondents expressed strong agreement, nearly one-quarter disagreed with the statement. Distance from health facilities and transportation costs were among the practical barriers relevant to treatment participation.

Table 3: Respondents' views on DOT and follow-up

Response category	Respondents, n	Percentage
Strongly agree	18	60%
Agree	2	7%
Uncertain	3	10%
Disagree	7	23%
Total	30	100%

Source: Primary research data, 2010.

The findings indicate that awareness of tuberculosis and acceptance of treatment-monitoring arrangements are distinct considerations. Even when patients understand the importance of follow-up, practical barriers may make participation difficult. This interpretation is consistent with research in Timor-Leste documenting barriers and enabling factors associated with tuberculosis treatment adherence (Martins et al., 2008). Studies of community health services have also examined how service organization and access-related difficulties can affect tuberculosis treatment delivery (Pradipta et al., 2022).

Further information about respondents' understanding of follow-up benefits is presented in Table 4. Twenty-three respondents (76%) strongly agreed that follow-up was beneficial, two (7%) agreed, three (10%) were uncertain, and two (7%) disagreed.

Table 4: Respondents' reported understanding of follow-up benefits

Response category	Respondents, n	Percentage
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Strongly agree	23	76%
Agree	2	7%
Uncertain	3	10%
Disagree	2	7%
Total	30	100%

Source: Primary research data, 2010.

The high proportion of respondents who strongly agreed with the benefits of follow-up suggests that many recognized the importance of treatment monitoring. However, awareness and actual attendance are separate dimensions. Research on tuberculosis treatment adherence similarly indicates that patients' knowledge and willingness need to be considered alongside the support available to them and the practical demands of accessing treatment (Alipanah et al., 2018; Davis et al., 2024). Accordingly, positive responses concerning follow-up should not automatically be interpreted as evidence that respondents attended every appointment or completed the prescribed treatment.

Understanding of Medication Benefits and Treatment Duration

The study also examined respondents' reported understanding of the benefits and side effects of anti-tuberculosis medication and the duration of treatment. As presented in Table 5, 27 respondents (90%) strongly agreed with the statement concerning medication benefits and side effects, while three (10%) were uncertain. No respondents selected agree or disagree. Table 6 shows that 28 respondents (93%) strongly agreed with the statement concerning treatment duration, while two (7%) were uncertain.

Table 5: Reported understanding of medication benefits and side effects

Response category	Respondents, n	Percentage
Strongly agree	27	90%
Agree	0	0%
Uncertain	3	10%
Disagree	0	0%
Total	30	100%

Source: Primary research data, 2010.

Table 6: Reported understanding of treatment duration

Response category	Respondents, n	Percentage
Strongly agree	28	93%
Agree	0	0%
Uncertain	2	7%
Disagree	0	0%
Total	30	100%

Source: Primary research data, 2010.

The results suggest that most respondents reported understanding the benefits of medication and the treatment duration explained to them. Nevertheless, these responses represent reported understanding rather than objectively verified knowledge or medication-taking behaviour. The treatment

duration of six to eight months documented in the study reflects the historical context of the 2010 research and should not be interpreted as a current treatment recommendation. Current treatment decisions should follow applicable clinical guidelines and depend on the patient's diagnosis and prescribed regimenx (World Health Organization, 2025c, 2025b).

The distinction between understanding treatment and adhering to it is central to interpreting these findings. Patients may recognize the benefits of medication yet still encounter barriers to regular treatment. Systematic reviews have examined educational, behavioural, and service-based approaches to adherence, indicating that effective treatment support involves more than communicating information alone (Müller et al., 2018; Pradipta et al., 2020; Siti Rahmah et al., 2025). The present study did not evaluate these interventions and therefore cannot establish which approach would be most effective in Turiscai.

Reported Implementation of DOT and Follow-up

The findings indicate that 13 respondents (43%) reported being able to attend the health facility or an agreed location to take medication under direct observation during the intensive phase. Seventeen respondents (57%) reported being unable to follow this arrangement. Distance from the health facility and insufficient money for daily transportation were identified as barriers to participation.

Table 7: Reported ability to participate in DOT

Response category	Respondents, n	Percentage
Strongly agree / reported ability to attend	13	43%
Agree	0	0%
Uncertain	0	0%
Disagree / reported inability to attend	17	57%
Total	30	100%

Source: Primary research data, 2010.

The results indicate that facility-based daily observation presented practical difficulties for a substantial proportion of respondents. The reported barriers suggest that treatment-monitoring arrangements imposed travel and financial demands on patients living far from the health centre. These findings are consistent with the relevance of geographical and economic barriers described in previous research on tuberculosis treatment adherence in Timor-Leste (Martins et al., 2008). Similar challenges have been examined in research on access to community-based tuberculosis services and in qualitative studies of treatment adherence in other settings (Pradipta et al., 2020; Sanauddin et al., 2025).

The findings also highlight the importance of distinguishing medication adherence from attendance at a health facility for observed dosing. The 43% figure represents respondents' reported ability to participate in the described DOT arrangement, rather than an overall medication-adherence rate. Attendance at a health facility does not necessarily establish that all prescribed doses were taken, while difficulty attending facility-based observation does not

independently establish that medication was not taken at home. Reviews of adherence interventions and communication strategies similarly examine a range of patient and service outcomes that cannot be reduced to attendance alone (Alipanah et al., 2018; Meira et al., 2025).

Regarding treatment follow-up, 27 respondents (90%) strongly agreed with the statement concerning follow-up implementation, two (7%) were uncertain, and one (3%) disagreed. These responses describe respondents' reported views concerning follow-up. They should be interpreted separately from the proportion of patients who actually attended appointments on schedule, because agreement with a statement and verified attendance are different measures.

Conceptual Interpretation of the Findings

The conceptual framework links patients' knowledge of tuberculosis with reported DOT implementation, treatment-related practices, and barriers to accessing health services. This framework is used to organize the descriptive findings rather than to establish a tested causal relationship between knowledge and treatment participation.

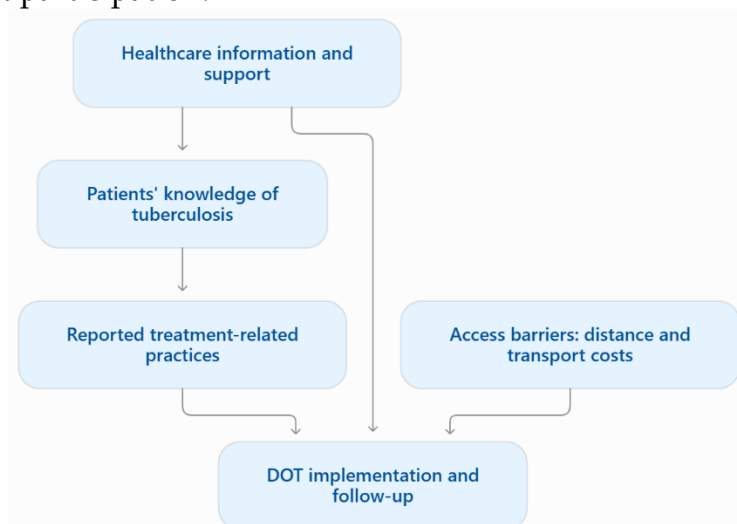


Figure 1. Adapted conceptual framework of tuberculosis knowledge, DOT implementation, and access barriers

Source: Author's own research framework, 2010.

The framework helps organize the findings. Respondents generally reported awareness of tuberculosis and the benefits of follow-up, yet more than half reported difficulty attending daily DOT. This contrast suggests that understanding the importance of treatment does not automatically eliminate practical barriers to participation. Previous studies have investigated educational support, treatment monitoring, communication, and digital approaches as potential ways to support adherence (Davis et al., 2024; Santosa et al., 2025; Tola et al., 2016). These approaches provide a broader context for interpreting the findings, although their effectiveness was not evaluated in the present study.

Implications for TB Services

The findings point to three areas for consideration in tuberculosis services. First, patient education should address symptoms, treatment benefits, possible side effects, and the purpose of follow-up. Second, treatment-monitoring arrangements should take into account the travel distances and transportation costs experienced by patients. Third, follow-up records should distinguish scheduled attendance, observed medication administration, and treatment completion because these represent different aspects of care. These implications are consistent with research examining adherence support and barriers to accessing services (Alipanah et al., 2018; Martins et al., 2008; Pradipta et al., 2020).

More recent evidence has considered communication strategies and digital adherence technologies, but their applicability depends on local resources, service organization, and patient circumstances (Meira et al., 2025; Santosa et al., 2025). The present study did not evaluate these approaches, so it would be inappropriate to conclude that any specific intervention would necessarily improve outcomes in Turiscai. Instead, the findings identify access and treatment-monitoring issues that could inform future service evaluation.

Limitations of the Findings

The findings should be interpreted in light of the descriptive design, the small facility-based sample of 30 patients, and the reliance on records and self-reported responses collected in 2010. The data do not support causal inference or generalization to all patients with tuberculosis in Timor-Leste. In addition, the study did not employ a documented validated composite measure of knowledge or adherence and did not test socioeconomic determinants using multivariable analysis. Consequently, the findings provide a contextual account of patients' reported knowledge and treatment-related practices rather than a comprehensive measurement of medication adherence.

Despite these limitations, the study provides a historical account of tuberculosis knowledge and the practical implementation of DOT at one health facility. Its contribution lies in documenting the contrast between reported understanding of treatment and reported difficulty attending daily observed dosing, particularly where distance and transportation costs were identified as barriers. These findings can be considered alongside more recent research and guidance on tuberculosis care to inform further investigation of treatment access and patient support in Timor-Leste (Craciun et al., 2023; World Health Organization, 2024, 2025b, 2025c).

CONCLUSION

This study examined tuberculosis knowledge and treatment adherence among 30 patients with bacteriologically positive tuberculosis registered at Centro de Saúde Turiscai, Timor-Leste, in 2010. The findings indicate that most respondents reported a good understanding of tuberculosis, including its transmission, treatment duration, and the benefits of anti-tuberculosis medication. However, knowledge did not necessarily translate into consistent participation in directly observed treatment (DOT). Although many respondents

recognized the importance of treatment follow-up, 57% reported difficulties attending DOT, primarily because of the distance to the health facility and transportation costs. These findings highlight the importance of addressing geographical and economic barriers alongside patient education to support treatment participation. Strengthening patient follow-up, improving access to health services, and providing practical support for patients facing transportation difficulties may help reduce these barriers. Nevertheless, the findings should be interpreted cautiously because the study involved a small sample from a single health facility and relied on descriptive data collected in 2010. Further studies involving larger samples and more systematic measurements of treatment adherence are needed to better understand the relationship between tuberculosis knowledge, healthcare accessibility, and treatment practices in Timor-Leste.

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