

FACTORS ASSOCIATED WITH TREATMENT NON-ADHERENCE AMONG TUBERCULOSIS PATIENTS IN THE FREE HEALTHCARE PROGRAM AT BARANTI PUBLIC HEALTH CENTER

Sulfa^{1*}, Pratiwi Ramlan², Khaeriyah Adri³, Sunandar Said⁴

Faculty of Health Sciences, Universitas Muhammadiyah Sidenreng Rappang,
Indonesia

sulfa087704@gmail.com^{1*}, pratiwiramlan.umsrappang@gmail.com²,
reekhaeriyah@gmail.com³, nandarnurse@gmail.com⁴

**Corresponding author*

Received May 8, 2026; Revised July 21, 2026; Accepted July 22, 2026; Published July 23, 2026

ABSTRACT

This study examined factors associated with treatment non-adherence among tuberculosis (TB) patients enrolled in the free healthcare program at Baranti Public Health Center, Sidenreng Rappang Regency, Indonesia. A quantitative cross-sectional design was used, and all 30 eligible TB patients undergoing treatment during the study period were recruited through total sampling. Data were collected using structured questionnaires assessing knowledge, motivation, perceived barriers, family support, access to healthcare services, and treatment adherence. Univariate statistics were used to summarize the data, while Chi-Square or Fisher's exact tests were applied as appropriate, with statistical significance set at $p < 0.05$. Fourteen respondents (46.7%) were classified as non-adherent. Perceived barriers were significantly associated with treatment non-adherence ($p = 0.021$), whereas knowledge ($p = 0.156$), motivation ($p = 0.232$), family support ($p = 0.452$), and access to healthcare services ($p = 0.153$) were not statistically significant. The novel contribution of this study is the simultaneous assessment of individual, family, service-access, and perceived-barrier factors in a free-treatment setting, where direct medication costs have already been removed. The findings indicate that residual treatment-related barriers remain relevant and should be addressed through patient-centered counseling, early management of medication-related problems, continuous follow-up, and practical support at the primary healthcare level.

Keywords: *Tuberculosis, treatment non-adherence, perceived barriers, family support, healthcare access.*

INTRODUCTION

Tuberculosis (TB) remains a major global public health problem. The World Health Organization estimated that 10.7 million people developed TB and 1.23 million died from the disease in 2024; Indonesia accounted for approximately 10% of global incident cases and remained one of the countries with the highest TB burden. Evidence from Indonesia also shows that treatment non-adherence continues to undermine TB control despite the availability of effective therapy (Lolong et al., 2023; World Health Organization, 2025).

TB treatment requires sustained medication use and regular follow-up over several months. Interruptions may contribute to treatment failure, relapse, continued transmission, and the emergence of drug-resistant TB. Studies in different settings have linked non-adherence to treatment phase, limited knowledge, adverse drug effects, poor communication, and psychosocial difficulties, indicating that adherence is a multidimensional behavior rather than a purely clinical issue (Sazali et al., 2023; Tiroro

et al., 2024).

In Indonesia, free anti-tuberculosis medication is delivered mainly through primary healthcare services. Removing direct medication costs is important, but it does not necessarily eliminate the indirect and non-financial burdens experienced by patients. National evidence has identified travel constraints, treatment fatigue, feeling better before treatment completion, work responsibilities, and inadequate support as reasons for missed doses or discontinuation (Ardenny et al., 2025; Lolong et al., 2023).

Knowledge and motivation may influence whether patients understand the consequences of interrupted treatment and remain committed during the intensive and continuation phases. However, recent findings are not uniform. Some studies found that poor TB knowledge was associated with non-adherence, whereas research in Indonesia reported strong relationships between motivation, family support, and adherence (Nindrea et al., 2025; Tirore et al., 2024). These differences suggest that local service conditions and patient characteristics may modify the contribution of each factor.

Family support may provide medication reminders, emotional encouragement, assistance with transportation, and help in communicating with healthcare workers. Recent Indonesian and international evidence generally supports the role of family involvement, although the magnitude of the relationship varies according to the type and quality of support measured (Agus & Rosmiati, 2025; Gurusinga et al., 2024; Lutfian et al., 2025; Saidi & Abdul Manaf, 2023).

Perceived barriers are central to the Health Belief Model and include obstacles that patients believe make treatment difficult. In TB care, these barriers may involve medication side effects, stigma, long treatment duration, transportation problems, waiting time, competing work demands, and treatment fatigue. Studies using the Health Belief Model and qualitative service-access approaches consistently show that greater perceived barriers can weaken adherence and engagement with TB services (Kılıç et al., 2025; Malla et al., 2025; Pusporini et al., 2024; Suprijandani et al., 2025).

Patient-centered interventions are therefore needed in addition to free medication. Counseling, motivational interviewing, family-oriented education, flexible follow-up, and digital adherence support may help patients manage difficulties throughout treatment. Recent reviews and intervention studies emphasize that adherence programs are most effective when they respond to the patient's practical, emotional, and informational needs rather than relying only on medication provision (Ardenny et al., 2025; Myburgh et al., 2023; Parwati et al., 2021; Sazali et al., 2023).

Although previous studies have examined knowledge, motivation, family support, healthcare access, and patient-centered interventions, limited evidence has evaluated these factors together within a free TB treatment program, where direct medication costs are removed but non-financial burdens may persist (Lolong et al., 2023; Malla et al., 2025; Myburgh et al., 2023). The novelty of this study lies in its simultaneous comparison of individual, family, service-access, and perceived-barrier factors in a primary healthcare setting. This approach enables a clearer assessment of whether residual non-financial barriers are more closely associated with non-adherence than knowledge, motivation,

family support, or basic service access and addresses a local evidence gap in Sidenreng Rappang Regency.

Accordingly, this study aimed to analyze the associations of knowledge, motivation, perceived barriers, family support, and access to healthcare services with treatment non-adherence among TB patients enrolled in the free healthcare program at Baranti Public Health Center.

RESEARCH METHOD

This study used a quantitative analytic design with a cross-sectional approach to examine factors associated with treatment non-adherence among TB patients enrolled in the free healthcare program at Baranti Public Health Center, Sidenreng Rappang Regency, Indonesia. The exposure variables and treatment-adherence outcome were measured during the same study period; therefore, the analysis estimates associations and does not establish temporal or causal effects.

The study population comprised all registered TB patients who were actively receiving anti-tuberculosis drugs at Baranti Public Health Center during the study period. Eligible participants had a confirmed TB diagnosis, were registered in the local TB treatment program, were in either the intensive or continuation phase, were able to communicate and complete the questionnaire, and provided written informed consent. Patients who were critically ill, unable to complete the questionnaire, transferred to another facility, or submitted incomplete data were excluded.

A total of 30 eligible patients were included using total sampling. The small sample reflects the number of registered patients who met the eligibility criteria and were undergoing treatment at the study site during data collection.

The dependent variable was treatment non-adherence. The independent variables were knowledge, motivation, perceived barriers, family support, and access to healthcare services. Knowledge represented the patient's understanding of TB and its treatment; motivation represented commitment to completing therapy; perceived barriers included treatment-related, logistical, and psychosocial obstacles; family support included emotional, informational, and practical assistance; and healthcare access included distance, transportation, service schedules, waiting time, and communication with healthcare workers. The relationships examined in the study are summarized in Figure 1.

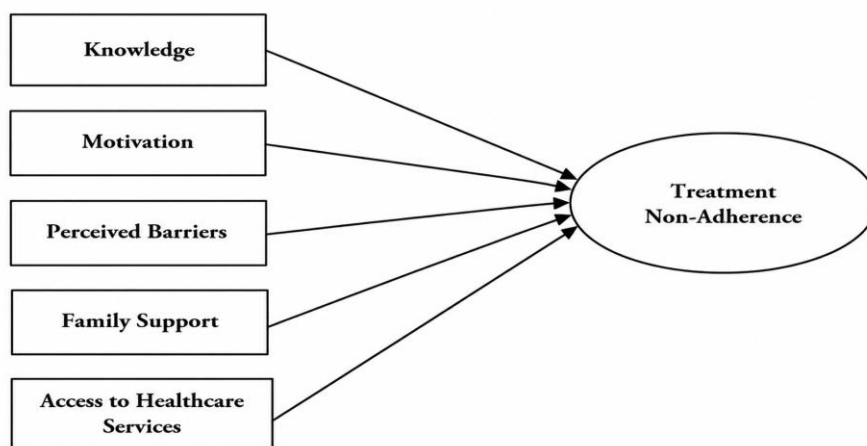


Figure 1. Conceptual framework of factors examined in relation to treatment non-adherence

Data were collected using structured questionnaires administered directly to respondents. Items were scored using ordinal or Likert-type response options and categorized according to the authors' predefined scoring criteria as good or poor knowledge, high or low motivation, high or low perceived barriers, high or low family support, good or poor healthcare access, and adherent or non-adherent treatment behavior. The submitted manuscript reported that all validity coefficients exceeded the *r*-table value of 0.361.

Univariate analysis summarized respondent characteristics and study variables using frequencies and percentages. Bivariate associations between each independent variable and treatment non-adherence were examined using the Chi-Square test; Fisher's exact test was specified when expected cell frequencies did not satisfy Chi-Square assumptions. Statistical significance was set at $p < 0.05$. Because the design was cross-sectional and the submitted results provided bivariate *p*-values only, the revised manuscript does not describe the analysis as a structural model, direct causal effect, or indirect effect.

Participants were informed about the study purpose, procedures, voluntary participation, confidentiality, and their right to withdraw. Written informed consent was obtained, and respondent identities were not included in the analysis or report.

RESULTS AND DISCUSSION

Results

Respondent Characteristics

Table 1 presents the demographic and study-variable profile of the 30 respondents. Male and female patients were equally represented. The largest age groups were 36–45 years and 46–55 years, each comprising 26.7% of participants. Most respondents had good knowledge (63.3%), whereas 60.0% had low motivation and 56.7% reported low family support. Most participants reported low perceived barriers (70.0%) and good

healthcare access (56.7%). Fourteen respondents (46.7%) were categorized as non-adherent to treatment.

Table 1. Respondent characteristics and distribution of study variables

Variable	Category	n	%
Sex	Male	15	50.0
	Female	15	50.0
Age	≤25 years	3	10.0
	26–35 years	4	13.3
	36–45 years	8	26.7
	46–55 years	8	26.7
	>55 years	7	23.3
	Good	19	63.3
Knowledge	Poor	11	36.7
Motivation	High	12	40.0
	Low	18	60.0
Perceived barriers	High	9	30.0
	Low	21	70.0
Family support	High	13	43.3
	Low	17	56.7
Access to healthcare services	Good	17	56.7
	Poor	13	43.3
Treatment adherence	Non-adherent	14	46.7
	Adherent	16	53.3

The distribution in Table 1 shows that non-adherence remained common despite generally good knowledge and relatively favorable healthcare access. This pattern supports the need to examine whether treatment behavior is more closely related to practical and psychosocial obstacles than to knowledge or service availability alone.

Bivariate Associations with Treatment Non-Adherence

The results of the bivariate hypothesis tests are summarized in Table 2. Perceived barriers were the only variable significantly associated with treatment non-adherence ($p = 0.021$). Knowledge ($p = 0.156$), motivation ($p = 0.232$), family support ($p = 0.452$), and access to healthcare services ($p = 0.153$) were not statistically significant at the 5% level. These results indicate association rather than causation and should be interpreted in light of the small, single-center sample.

Table 2. Bivariate associations between study variables and treatment non-adherence

Variable	P-value	Statistical interpretation	Hypothesis decision
Knowledge	0.156	Not significant	Rejected
Motivation	0.232	Not significant	Rejected
Perceived barriers	0.021*	Significant	Accepted
Family support	0.452	Not significant	Rejected
Access to healthcare services	0.153	Not significant	Rejected

Note. * $p < 0.05$. Values are based on the bivariate analysis reported by the authors.

Discussion

Knowledge was not significantly associated with treatment non-adherence in this sample ($p = 0.156$), although most respondents had good knowledge. This finding suggests that understanding the disease and treatment schedule may be necessary but not sufficient to sustain adherence when patients face practical or emotional difficulties. It differs from the study in Hossana, where poor TB knowledge was associated with non-adherence, and from national Indonesian evidence showing that adherence is shaped by multiple sociodemographic and behavioral conditions (Lolong et al., 2023; Tirore et al., 2024). The difference may reflect the small local sample, limited variability in knowledge scores, or the way knowledge was categorized.

Motivation was also not statistically significant ($p = 0.232$). Motivation can change over the course of a lengthy treatment regimen as symptoms improve, adverse effects emerge, or treatment fatigue develops. In contrast, Nindrea et al. (2025) reported that motivation and family support were significantly related to adherence among Indonesian TB patients, while Health Belief Model-based motivational interviewing improved adherence and treatment success in another Indonesian study (Parwati et al., 2021). The present result therefore should not be interpreted as evidence that motivation is unimportant; rather, its contribution may not have been detectable in this small cross-sectional sample.

Family support showed no significant association with non-adherence ($p = 0.452$). This differs from studies reporting that emotional, appreciation, informational, and practical support improved adherence or patient outcomes (Agus & Rosmiati, 2025; Gurusinga et al., 2024; Saidi & Abdul Manaf, 2023). A recent scoping review similarly concluded that family and social support are important for medication adherence and quality of life (Lutfian et al., 2025). The discrepancy may be related to differences in sample size, support measurement, household involvement, or the possibility that strong treatment barriers outweighed the support available to some patients.

Access to healthcare services was not significantly associated with non-adherence ($p = 0.153$). Free medication and the availability of treatment at a local public health center may have reduced variation in basic service access. Nevertheless, access should not be understood solely as physical availability. Qualitative evidence shows that travel frequency, distance, time costs, infrastructure, and service organization can still disrupt TB care, particularly in rural settings (Malla et al., 2025). Tirore et al. (2024) also identified facility accessibility and patient-provider factors among relevant adherence determinants. The absence of statistical significance in this study may therefore reflect limited power rather than the absence of service-related challenges.

Perceived barriers were the only variable significantly associated with treatment non-adherence ($p = 0.021$). This result is consistent with the Health Belief Model, which proposes that individuals are less likely to carry out a recommended health behavior when the perceived obstacles are greater than the expected benefits. Indonesian research has shown that perceived barriers can reduce DOTS adherence and shape TB-related behavior (Pusporini et al., 2024; Suprijandani et al., 2025). The finding also aligns with evidence

that stigma can discourage engagement with testing and treatment and that logistical barriers can impede access and treatment completion (Kılıç et al., 2025; Malla et al., 2025).

The practical implication is that providing medication free of charge should be combined with systematic identification and management of each patient's barriers. Health workers can assess adverse effects, transportation and work constraints, stigma, treatment fatigue, and understanding of follow-up requirements at every visit. Health Belief Model-based education has improved medication adherence in rural Indonesia, while digital reminders and video-observed or mobile-supported treatment may offer additional options for patients with mobility or scheduling constraints (Ardenny et al., 2025; Sazali et al., 2023).

A patient-centered strategy should also involve family members or treatment supporters when appropriate, offer counseling and empathetic communication, and provide flexible follow-up for patients at risk of interruption. Reviews of patient-centered TB care emphasize that interventions should be adapted to patients' social and practical circumstances rather than delivered as a uniform package (Myburgh et al., 2023). Family-oriented education and motivational interviewing may complement barrier reduction, even though family support and motivation were not statistically significant in the present analysis (Parwati et al., 2021; Saidi & Abdul Manaf, 2023).

Study Limitations

This study has several limitations. The sample comprised only 30 patients from one public health center, which limits statistical power and generalizability. The cross-sectional design does not establish temporal or causal relationships. The variables were based on self-reported questionnaire responses and dichotomized categories, which may introduce recall, social-desirability, and information loss. In addition, the submitted results did not provide cross-tabulated cell counts, effect sizes, confidence intervals, or multivariable estimates. Future studies should recruit larger multisite samples, report validated reliability coefficients, retain continuous scale information where appropriate, and use multivariable regression to estimate adjusted associations.

CONCLUSION

Perceived barriers were the only factor significantly associated with treatment non-adherence among the variables examined in TB patients enrolled in the free healthcare program at Baranti Public Health Center. Knowledge, motivation, family support, and access to healthcare services were not statistically significant in this small sample. The findings suggest that free medication alone may not address treatment-related, logistical, and psychosocial difficulties. Primary healthcare providers should routinely identify patient-specific barriers, manage medication-related problems, strengthen counseling and follow-up, and involve family or treatment supporters when appropriate. Because of the small cross-sectional sample, the results should be interpreted as local associative evidence and confirmed in larger multisite studies.

REFERENCES

- Agus, A. I., & Rosmiati (2025). Association of Family Support with Treatment Adherence in Tuberculosis Patients. *Omni Health Journal*, 3(1), 1–7. <https://doi.org/10.65277/ohj.v3i1.233>
- Ardenny, A., Rusdi, I., Idayanti, I., & Oktariani, F. (2025). The effectiveness of Health Belief Model intervention on tuberculosis medication adherence in rural Indonesia: A pre-experimental study. *Healthcare in Low-Resource Settings*, 13(4), 13966. <https://doi.org/10.4081/hls.2025.13966>
- Gurusinga, R., Afrizal, A., Bachtiar, A., Firdawati, F., Machmud, R., Burhan, E., Jendrius, J., & Semiarty, R. (2024). The relationship between family support and treatment adherence in patients with tuberculosis in Deli Serdang Regency, Indonesia, 2022: A cross-sectional study. *Nursing and Midwifery Studies*, 13(3), 132–139. <https://doi.org/10.48307/nms.2024.441017.1351>
- Kılıç, A., Zhou, X., Moon, Z., Hamada, Y., Duong, T., Layton, C., Jhuree, S., Abubakar, I., Rangaka, M. X., & Horne, R. (2025). A systematic review exploring the role of tuberculosis stigma on test and treatment uptake for tuberculosis infection. *BMC Public Health*, 25, 628. <https://doi.org/10.1186/s12889-024-20868-0>
- Lolong, D. B., Aryastami, N. K., Kusrini, I., Tobing, K. L., Tarigan, I., Isfandari, S., Senewe, F. P., Raflizar, Endah, N., Sitorus, N., Pangaribuan, L., Simarmata, O. S., & Ariati, Y. (2023). Nonadherence to anti-tuberculosis treatment, reasons and associated factors among pulmonary tuberculosis patients in the communities in Indonesia. *PLOS ONE*, 18(8), e0287628. <https://doi.org/10.1371/journal.pone.0287628>
- Lutfian, L., Azizah, A., Wardika, I. J., Wildana, F., Maulana, S., & Wartakusumah, R. (2025). The role of family support in medication adherence and quality of life among tuberculosis patients: A scoping review. *Japan Journal of Nursing Science*, 22(1), e12629. <https://doi.org/10.1111/jjns.12629>
- Malla, E., Shahi, S., & Forsberg, B. (2025). Barriers and facilitators to tuberculosis service access for patients in Bajhang, Nepal: A qualitative study based on focus groups with patients, screening camp visitors, community volunteers and medical doctors. *Journal of Health, Population and Nutrition*, 44(1), 46. <https://doi.org/10.1186/s41043-025-00788-4>
- Myburgh, H., Baloyi, D., Loveday, M., Meehan, S. A., Osman, M., Wademan, D., Hesselning, A., & Hoddinott, G. (2023). A scoping review of patient-centred tuberculosis care interventions: Gaps and opportunities. *PLOS Global Public Health*, 3(2), e0001357. <https://doi.org/10.1371/journal.pgph.0001357>
- Nindrea, R. D., Ming, L. C., & Agustian, D. R. (2025). Family support, motivation, and patient adherence to tuberculosis treatment: Insights from Indonesia. *African Journal of Infectious Diseases*, 19(2), 42–48. <https://doi.org/10.21010/Ajid%20v19i2.5>

- Parwati, N. M., Bakta, I. M., Januraga, P. P., & Wirawan, I. M. A. (2021). A Health Belief Model-based motivational interviewing for medication adherence and treatment success in pulmonary tuberculosis patients. *International Journal of Environmental Research and Public Health*, 18(24), 13238. <https://doi.org/10.3390/ijerph182413238>
- Pusporini, P., Tamtomo, D. G., & Prasetya, H. (2024). Adherence to Direct Observed Treatment Short-Course treatment in tuberculosis: Application of the Health Belief Model. *Journal of Health Promotion and Behavior*, 9(2), 154–165. <https://doi.org/10.26911/thejhp.2024.09.02.06>
- Saidi, S. S., & Abdul Manaf, R. (2023). Effectiveness of family support health education intervention to improve health-related quality of life among pulmonary tuberculosis patients in Melaka, Malaysia. *BMC Pulmonary Medicine*, 23, 139. <https://doi.org/10.1186/s12890-023-02440-5>
- Sazali, M. F., Abdul Rahim, S. S. S., Mohammad, A. H., Kadir, F., Payus, A. O., Avoi, R., Jeffree, M. S., Omar, A., Ibrahim, M. Y., Atil, A., Tuah, N. M., Dapari, R., Lansing, M. G., Abdul Rahim, A. A., & Azhar, Z. I. (2023). Improving tuberculosis medication adherence: The potential of integrating digital technology and Health Belief Model. *Tuberculosis and Respiratory Diseases*, 86(2), 82–93. <https://doi.org/10.4046/trd.2022.0148>
- Suprijandani, S., Setiawan, S., Pathurrahman, P., Wardoyo, S., & Rahayyu, A. M. (2025). The behaviour of TB patients in East Lombok through a Health Belief Model approach. *Journal of Health, Population and Nutrition*, 44, 23. <https://doi.org/10.1186/s41043-025-00746-0>
- Tirote, L. L., Ersido, T., Handiso, T. B., & Areba, A. S. (2024). Non-adherence to anti-tuberculosis treatment and associated factors among TB patients in public health facilities of Hossana town, Southern Ethiopia, 2022. *Frontiers in Medicine*, 11, 1360351. <https://doi.org/10.3389/fmed.2024.1360351>
- World Health Organization. (2025). Global tuberculosis report 2025. World Health Organization. <https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/tb-reports/global-tuberculosis-report-2025>