# Structured Education and Daily Reminders to Improve Medication Adherence in Tuberculosis Patients: A Case Study

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**A R T I C L E   I N F O**

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**A B S T R A C T**

**Introduction**: Background: Non-compliance with TB treatment is one of the main and most crucial challenges in global TB control efforts. This condition contributes to high rates of treatment failure. Approximately 40% of patients in developing countries are known to have low compliance with pulmonary TB treatment. Methods: This was a descriptive case study using a pre- and post-test approach. The instrument used in this case study was the 8-Item Morisky Medication Adherence Scale questionnaire to measure the level of medication adherence among tuberculosis patients, namely Ms. S. This study was conducted in the treatment room of the Infection Center RSUP Wahidin Sudirohusodo Makassar held from June 27, 2025 to July 11, 2025. Before conducting the intervention, the researchers obtained informed consent from the patients and their families, and the study obtained permission from the hospital. Result: The provision of structured educational interventions and daily reminders in the form of reminder books can be considered effective in improving medication adherence among TB patients, as evidenced by the post-intervention questionnaire score of 6 (moderate adherence level), which increased from the pre-intervention questionnaire score of 1 (low adherence level). Conclusion: From this case study, it was found that the implementation of structural educational interventions and daily reminders was effective in improving medication adherence among TB patients.

## INTRODUCTION

Tuberculosis (TB) is a serious infectious disease that primarily affects the lung. It is caused by the bacterium Mycobacterium tuberculosis, which can be transmitted from one person to another through small airborne droplets released when coughing or sneezing  (1). There are approximately 10.6 million cases of tuberculosis worldwide. Of these, 3.4 million were women, 1.2 million were children, and 6 million were men. Tuberculosis is prevalent in almost all countries and affects people of all ages worldwide. The three countries with the highest number of tuberculosis cases worldwide are India (28%), Indonesia (9.2%), and China (7.4%) (2). In 2019, there were an estimated 770,000–932,000 new cases of pulmonary tuberculosis in Indonesia, with 19,000 of them being cases of tuberculosis with HIV-positive. Indonesia is among the 30 countries with the highest burden of TB in the world, ranking second after India in terms of the number of TB cases (3). Approximately 90% of TB cases occur in adults, with the number of cases in men being higher than that in women at a ratio of approximately two to one (4).

The Sustainable Development Goals (SDGs) program developed by the United Nations (UN) aims to end the tuberculosis epidemic by 2030 (2). The Directly Observed Treatment Short-course (DOTS) program is a strategy recommended by the WHO for tuberculosis control. There are five intervention programs under the DOTS program: political commitment, case detection, drug distribution, drug adherence monitoring, and recording and reporting. The implementation of the DOTS program has proven to be quite effective in controlling TB-related deaths in some countries, and the DOTS program is considered crucial in improving medication adherence among TB patients, as one of its components involves the Medication Supervisor (MS) to ensure that patients complete their treatment as scheduled (5). However, on the other hand, the DOTS strategy is also considered insufficiently effective in improving patient adherence and knowledge, as evidenced by the high global prevalence of pulmonary TB in Indonesia (6). The ineffectiveness of the DOTS program and other programs in improving medication adherence among patients with TB is attributed to several factors, including patients' lack of understanding of treatment, medication side effects, insufficient social support, and logistical issues in medication supply (7).

Efforts to treat patients with TB, such as seeking treatment, ensuring compliance, conducting regular check-ups, and maintaining emotional well-being through prayer or positive activities, greatly assist the self-care process

and support patient recovery. One of the most important strategies is to improve medication adherence among patients with tuberculosis (8). Adherence to pulmonary TB treatment plays an important role in healing. When patients do not adhere to therapy, this can worsen their health condition, increase the risk of transmission, trigger drug resistance, and even lead to death (9). Approximately 40% of patients in developing countries have low adherence to pulmonary TB treatment (10). Additionally, patients' lack of understanding of the disease and its treatment, as well as insufficient family support, can contribute to low adherence rates to medication (11). One of the causes of the high prevalence of TB is the lack of knowledge among patients. Research shows that patients' knowledge of TB is still very low and that there is a gap between the knowledge and perceptions of patients and their families about TB (12).

Given these issues, appropriate strategies or interventions are needed to support efforts to improve medication adherence among patients with TB. Several interventions have been implemented to improve medication adherence among TB patients, such as the use of reminders via the WhatsApp application, which has been found to be effective in improving medication adherence (13). The implementation of educational programs and medication reminder apps has also been applied, but it is considered insufficiently effective in improving medication adherence among patients with TB (10). Therefore, this study aimed to implement a modified intervention from previous interventions, combining structured educational interventions with daily reminders in the form of a medication adherence journal and reminders from the patient's close relatives acting as medication supervisors (PMO) to assess the effectiveness of the intervention and its impact on improving medication adherence among TB patients.

## METHODS

This was a descriptive case study using a pre- and post-test approach. The instrument used in this case study was the 8-Item Morisky Medication Adherence Scale questionnaire to measure the level of medication adherence among one tuberculosis patients, namely Ms. S. This study was conducted in the treatment room of the Infection Center RSUP Wahidin Sudirohusodo Makassar held from June 27, 2025 to July 11, 2025. Before conducting the intervention, the researchers obtained informed consent from the patients and their families, and the study obtained permission from the hospital.

## RESULT AND DISCUSSION

### RESULTS

#### *Respondent Characteristics*

A 20-year-old female patient with the initials Ms. S was admitted to the hospital on June 26, 2025, and was treated in the Infection Center on the 2nd floor of RSUP Wahidin Sudirohusodo Makassar with a diagnosis of bacteriologically confirmed pulmonary tuberculosis due to discontinuation of her medication. The patient was a Muslim of Makassar ethnicity and resided at Jl. Sungai Limboto Lr. 54. No.20 B.

#### *Pre-Intervention Medication Adherence Questionnaire Score*

Table 1. Pre-intervention medication adherence questionnaire score (n=1)

| Question | Yes | No | Score |
|---|---|---|---|
| Have you ever forgotten to take your medication? | ✓ | | 0 |
| During the past two weeks, have you intentionally not taken your TB medication? | ✓ | | 0 |
| Have you ever reduced or stopped taking your medication without telling your doctor because you felt worse when taking it? | ✓ | | 0 |
| When traveling, have you ever forgotten to bring your medication? | ✓ | | 0 |
| Did you take your medication yesterday? | | ✓ | 0 |
| When you feel healthy, do you stop taking your medication? | | ✓ | 1 |
| Do you find it difficult to follow your treatment? | ✓ | | 0 |
| Do you have difficulty taking your medication? <br> a. Never <br> b. Occasionally <br> c. Sometimes | ✓ | | 0 |
| Total Score | | | 1  (Poor) |

*Source : Primary Data, (2025)*

Table 1 shows that a score of 1 was obtained, indicating a low level of compliance among patients taking tuberculosis medication. From the results of the assessment through interviews, the factors causing patients to be non-compliant in taking medication were daily work commitments and the side effects of OAT, which made patients uncomfortable and ultimately led them to decide not to take the medication.

After completing the pre-intervention questionnaire, structured education was conducted over three consecutive days, with a different educational topic for each session. The first day of education (June 30, 2025) focused on the topic "Understanding What Tuberculosis Is," the second day of education (July 1, 2025) focused on the topic "Drug-Resistant Tuberculosis," and the third day of education (July 2, 2025) focused on the topic "How to Improve Medication Adherence." On July 4, 2025, the patient began the first day of OAT. Following this, an intervention involving daily reminders was implemented on July 7, 2025, by providing patients with a medication adherence journal. Patients are encouraged to fill out the journal after each dose to enhance their self-management and track their progress in adhering to OAT. Additionally, the role of family members as Medication Supervisors (PMO) was implemented for the patient to support the educational intervention and daily reminder program, ensuring that they were carried out effectively to improve medication adherence.

### Post-Intervention Medication Adherence Questionnaire Score

Table 2. Post-intervention medication adherence questionnaire score (n=1)

| Question | Yes | No | Score |
|---|---|---|---|
| Have you ever forgotten to take your medication? | ✓ | | 0 |
| During the past two weeks, have you intentionally not taken your TB medication? | ✓ | | 1 |
| Have you ever reduced or stopped taking your medication without telling your doctor because you felt worse when taking it? | | ✓ | 1 |
| When traveling, have you ever forgotten to bring your medication? | | ✓ | 1 |
| Did you take your medication yesterday? | ✓ | 1 | |
| When you feel healthy, do you stop taking your medication? | | ✓ | 1 |
| Do you find it difficult to follow your treatment? | ✓ | | 0 |
| Do you have difficulty taking your medication?<br>a. Never<br>b. Occasionally<br>c. Sometimes | | ✓ | 1 |
| Total  Score | | | 6  (Moderate) |

*Source : Primary Data, (2025)*

Table 2 shows a score of 6, indicating moderate compliance with tuberculosis medication. From the interview with the patient's family, the patient's mother said that the patient had been taking his medication regularly for two weeks without missing a dose, and that during the week the patient had been taking the medication, there were no side effects from the medication.After providing structured education and daily reminders in the form of reminder books to patients, the researchers evaluated patient compliance with medication during two weeks of OAT therapy. In accordance with the theory used in The 8 Item-Morisky Medication Scale questionnaire, which states that two weeks is sufficient time to capture patient behavior patterns toward treatment and that two weeks is considered an accurate period of time
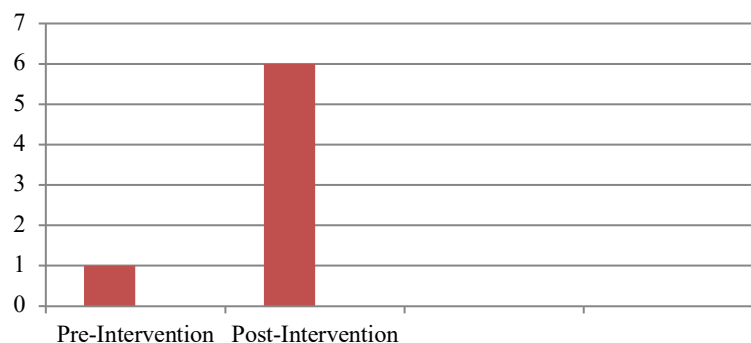


Figure 1. Compliance Score Diagram for Pre- and Post-Intervention

Figure 1 shows the results of the compliance questionnaire after the structured educational intervention and daily reminders in the form of reminder books. The compliance score increased to 6, which is classified as moderate compliance, whereas previously it was only 1, which is classified as low compliance. Therefore, it can be said that structured educational interventions and daily reminders have a significant effect on improving patient medication compliance.

## DISCUSSION

### The Effect of Structured Education on Medicaton Adherence

Structured education can indirectly increase the level of medication adherence among patients with tuberculosis because through education, patients' knowledge, awareness, and motivation about their treatment increase, making them more aware of the importance of completing the treatment procedure. This aligns with research conducted by Pagayang, Umboh, and Mapanawang, which states that an individual's level of knowledge influences their adherence to taking anti-tuberculosis medication. If a patient's knowledge is low, the risk of non-adherence to treatment can increase up to eightfold (14). Patients' knowledge about pulmonary tuberculosis is also a factor that can support the success of tuberculosis treatment programs (15). Several factors influence a person's non-adherence to OAT, including a lack of knowledge about the purpose of treatment and patients not understanding the importance of the established treatment guidelines (16). In contrast, the study conducted by Reyaan, Faustincia, and Zazuli found that the educational methods used in this study were not effective in improving patients' knowledge and adherence to TB treatment due to varying initial knowledge levels among participants (9).

### The Effect of Daily Reminder on Medicaton Adherence

In addition to providing structured educational interventions to patients and their families, reminder books for medication adherence were provided to support patients' adherence to their medication regimens. One intervention that can be implemented to improve patient adherence to therapy is the application of self-management. With self-management, patients can monitor their treatment independently, and reminder books are tools that can help individuals remember things because of their internal motivation to track their progress in undergoing treatment. Reminder books can also improve medication adherence in patients because they feel a sense of responsibility to adhere to their treatment (17).

The self-management approach aims to improve self-monitoring, stimulus control (self-control), and self-reward, as well as controlled therapy, so that the success of the therapy can be seen from the increase in the average score, thereby improving the quality of life of patients with TB. Self-monitoring can also improve understanding after receiving educational explanations about what TB is, its causes, signs and symptoms, and its transmission (18).

### The Effect of PMO (Medication Supervisor) on Medicaton Adherence

The success of the intervention in this study was also due to the role of the PMO, namely, the patient's mother, who supervised the patient's medication intake, thereby greatly supporting the effectiveness of the intervention. This aligns with previous research stating that TB patients' adherence to medication is significantly influenced by the PMO (Medication Supervisor), who is typically a family member or the patient's personal assistant (19). Family members should be the best PMOs for patients to improve medication adherence, as family support plays a crucial role in enhancing treatment adherence among patients with tuberculosis. Patients who receive good family support are 6.2 times more likely to adhere to their tuberculosis medication regimens (20). This aligns with the findings of a study conducted by Meldawaty, Utami, and Wulandari, which states that family is a determining factor in shaping patients' adherence and motivation in selecting and undergoing appropriate treatment programs (21). The results of this study are similar to those of Dessy's study, which states that family support affects the level of compliance and found that good family support was 90.5%; therefore, it is recommended to involve the family in the treatment process (22).

### The effect of medication adherence on the success of TB treatment

Patient compliance in completing pulmonary TB treatment is a crucial factor, as it can have a positive impact by reducing transmission rates, preventing recurrence, inhibiting bacterial growth, reducing drug resistance, and reducing the risk of disability in patients. The ultimate impact is the reduction in the number of patients with

pulmonary TB. However, the lengthy duration of pulmonary TB treatment often causes patients to feel bored, leading to non-compliance in taking their medications. This non-compliance or incomplete treatment can cause the bacteria that cause TB to become resistant to anti-TB drugs (OAT), a condition known as multi-drug-resistant TB (MDR TB) (23). According to researchers, this compliance is influenced by factors within the patient themselves (24). In addition, there is the possibility of reactions to the medications being taken. Side effects such as itching, nausea, vomiting, bone pain, and headaches can cause patients to feel that their health is not improving, resulting in them no longer complying with their tuberculosis medication (25).

## CONCLUSION

Several methods or efforts that can be undertaken to improve medication adherence among tuberculosis patients include providing education, distributing daily reminders in the form of medication adherence reminder books, digital daily reminders such as setting alarms on mobile phones and through the WhatsApp app, and the role of the PMO. From this case study, it can be concluded that structured educational interventions and daily reminders significantly impact efforts to improve medication adherence among patients with TB, as well as the role of family members (the patient's mother) as effective PMOs in increasing patients' awareness of the importance of adhering to their medication regimen.

## ACKNOWLEDGEMENTS

## REFERENCES

1. Adigun R, Singh R. Tuberculosis. Treasure Island (FL): StatPearls Publishing; 2021.
2. World Health Organization (WHO). Global Tuberculosis Report 2022. Geneva: World Health Organization; 2022 [cited 2025 Jun 28]. Available from: https://www.who.int/news-room/fact-sheets/detail/tuberculosis
3. Kementerian Kesehatan Republik Indonesia. Pedoman nasional pelayanan kedokteran tata laksana tuberkulosis. Jakarta: Kementerian Kesehatan RI; 2019.
4. Latif AI, Tiala NH, Masahuddin L. Edukasi pencegahan penularan tuberkulosis di Desa Borisallo. Idea Pengabdian Masyarakat. 2023 Feb 10;3(2):65-8.
5. Saragih FL, Sirait H. Hubungan pengetahuan dan sikap dengan kepatuhan minum obat anti tuberkulosis pada pasien TB paru di Puskesmas Teladan Medan tahun 2019. Jurnal Riset Hesti Medan Akper Kesdam I/BB Medan. 2020;5(1):9-15. doi:10.34008/jurhesti.v5i1.131
6. World Health Organization (WHO). Global Tuberculosis Report 2023. Geneva: World Health Organization; 2023.
7. Ningrum Y. Faktor-faktor yang mempengaruhi kepatuhan minum obat pada penderita TB paru. Jombang: Institut Teknologi Sains dan Kesehatan Insan Cendekia Medika; 2023.
8. Riska NE, Desi, Anwar MA. Kualitas hidup dan strategi koping pasien pasca pengobatan tuberculosis multidrug resistance. 2021;9(2):453-62.
9. Gebreweld FH, Kifle MM, Gebremicheal FE, Simel LL, Gezae MM, Ghebreyesus SS, et al. Factors influencing adherence to tuberculosis treatment in Asmara, Eritrea: a qualitative study. J Health Popul Nutr. 2018;37(1):1-9.
10. Reyaan IBM, Faustincia I, Zazuli Z. Dampak intervensi edukasi dan aplikasi pengingat minum obat terhadap pengetahuan dan kepatuhan pasien tuberkulosis paru di puskesmas di Kota Bandung. J Manaj Pelayanan Farm. 2023;13(4):256-65.
11. Boru CG, Shimels T, Bilal AI. Factors contributing to nonadherence with treatment among TB patients in Sodo Woreda, Gurage Zone, Southern Ethiopia: a qualitative study. J Infect Public Health. 2017;10(5):527-33.
12. Awoke N, Dulo B, Wudneh F. Total delay in treatment of tuberculosis and associated factors among new pulmonary TB patients in selected health facilities of Gedeo Zone, Southern Ethiopia, 2017/18. Interdiscip Perspect Infect Dis. 2019;2019:1-9.
13. Basri AA, Khasanah U, Anggraini D, Vitaliati T. Program mobilephone reminder terhadap peningkatan kepatuhan pengobatan pasien TB paru. Jurnal Keperawatan. 2023;15(1):23-32.
14. Pagayang ZI, Umboh JM, Mapanawang AL. Faktor-faktor yang berhubungan dengan kepatuhan minum obat pada penderita tuberkulosis paru di Puskesmas Kamonji Kota Palu. Graha Medika Nurs J. 2019;2(1):63-71.

15. Rusman R. Faktor yang mempengaruhi penderita TB paru terhadap kepatuhan minum obat anti tuberkulosis di Puskesmas Jatisawit Indramayu. Afiasi J Kesehat Masy. 2019;4(1):33-40.

16. Suhedi H, Susanti D, Setiawan RA, Lameky VY. Pengaruh edukasi tuberkulosis berbasis audiovisual terhadap kepatuhan minum obat pasien tuberkulosis paru di Puskesmas Setiabudi Kota Jakarta Selatan. Glob Health Sci. 2022;7(1):31-5.

17. Fadillah R. Pengaruh pemberian buku pengingat terhadap kepatuhan terapi pada pasien gagal jantung di Rumah Sakit Islam UNISMA Malang [dissertation]. Malang: Universitas Brawijaya; 2018.

18. Faisal F, Rachmawaty R, Sjattar EL. Edukasi dan interactive nursing reminder dengan pendekatan self management untuk meningkatkan kepatuhan minum obat dan kualitas hidup pasien tuberculosis. J Telenursing. 2021;3(2):725-34.

19. Tkela MY, Sambriong M, Kapitan M. Implementation of alarm and pill reminder for medication adherence in tuberculosis patients. J EduHealth. 2025;16(1):271-7.

20. Widani NL, Sianturi SR. Relationship between drug consumption, supervisors' knowledge and support, and patients' obedience to take tuberculosis drugs. Indones J Nurs Pract. 2020;4(1):46-52.

21. Meldawaty S, Rizki SU, Yulianty W. Faktor-faktor yang berhubungan dengan obat anti tuberkulosis (OAT) dalam kepatuhan minum OAT pada pasien tuberkulosis paru di wilayah kerja UPTD Puskesmas Kabupaten Bintan. Nurs Update J Ilm Ilmu Keperawatan. 2023 [cited 2025 Sep 20]. Available from: https://stikes-nhm.e-journal.id/NU/article/view/1063

22. Herawati C, Abdurakhman RN, Rundamintasih N. Peran dukungan keluarga, petugas kesehatan dan perceived stigma dalam meningkatkan kepatuhan minum obat pada penderita tuberculosis paru. J Kesehat Masy Indones. 2020;15(1):19-23.

23. Pratiwi DR, Jupriadi L, Firmansyah D, Maryam S. Pengetahuan mengenai tuberkulosis dengan kepatuhan minum obat pada pasien TB di Rumah Sakit Harapan Keluarga Mataram. Lumbung Farm J Ilmu Kefarmasian. 2023;4(1):173-7.

24. Wulandari ISM, Rantung J, Malinti E. Faktor yang berhubungan dengan kepatuhan minum obat pasien TB di wilayah kerja Puskesmas Parongpong. J Keperawatan Muhammadiyah. 2020;5(1):1-7.

25. Adam L. Pengetahuan penderita tuberkulosis paru terhadap kepatuhan minum obat anti tuberkulosis. Jambura Health Sport J. 2020;2(1):12-8.