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Review Article

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Literature Review: Factors Influencing Compliance with Taking Anti-Tuberculosis Drugs (OAT) in Pulmonary Tuberculosis Patients

Dewi Jayanti[1*], Nia Kania[2], Husaini[3], Mohammad Isa[4], Izaak Zoelkarnain[5]

[1,2,3,4,5]Masters Programme of Public Health Study, Faculty of Medicine and Health Sciences, University of Lambung Mangkurat, South Kalimantan, Indonesia

Abstract: Tuberculosis (TB) remains a major global public health problem, with treatment success highly dependent on patients' adherence to anti-tuberculosis drugs (OAT). Non-compliance may lead to treatment failure, increased transmission, and the development of drug-resistant TB. Several factors are known to influence medication adherence, including education level, knowledge, and support from healthcare workers.

Objective: This study aimed to review and synthesize evidence on factors influencing compliance with taking anti-tuberculosis drugs, focusing on education level, knowledge, and healthcare worker support.

This study employed a literature review design. Articles were retrieved from ScienceDirect and Google Scholar databases and selected based on predefined inclusion and exclusion criteria. Inclusion criteria were open-access full-text articles published between 2021 and 2025 that discussed adherence to OAT treatment and related factors. A total of fourteen relevant articles were included in the review.

The review findings showed that patients' knowledge and support from healthcare workers were the most consistently associated factors with medication adherence. Higher levels of knowledge were linked to better compliance with treatment regimens. Support from healthcare workers, including counseling, supervision, and motivation, played a critical role in improving adherence. The level of education demonstrated an indirect influence, as higher education facilitated understanding but did not independently guarantee compliance.

Knowledge and healthcare worker support are key determinants of adherence to anti-tuberculosis drug treatment. Strengthening patient education and optimizing the role of healthcare workers are essential strategies to improve treatment compliance and prevent drug resistance.

Keywords: *Medication Adherence, Anti-Tuberculosis Drugs, Education Level, Knowledge and Healthcare Worker Support*

1. Introduction

Tuberculosis remains a major global public health concern. Pulmonary tuberculosis is an infectious disease that primarily affects the lung parenchyma and is caused by pathogenic microorganisms, specifically acid-fast *Mycobacterium tuberculosis*. In addition to the lungs, TB may also involve other organs, known as extrapulmonary tuberculosis (Siburian et al., 2024). Although tuberculosis is a preventable and generally curable disease, in 2022 it became the second leading cause of death worldwide due to a single infectious agent, following coronavirus disease (COVID-19), resulting in nearly twice as many deaths as HIV/AIDS. Each year, more

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Corresponding Author: Dewi Jayanti

than 10 million people develop TB, highlighting the urgent need for global efforts to end the TB epidemic by 2030, a target endorsed by all United Nations (UN) Member States and the World Health Organization (WHO) (WHO, 2023).

Tuberculosis is caused by *Mycobacterium tuberculosis*, which is transmitted through airborne particles released when individuals with TB expel bacteria into the air, such as during coughing. Transmission primarily occurs from patients with smear-positive TB through sputum droplets, although individuals with smear-negative TB may still transmit the disease, albeit at a lower rate. Eliminating tuberculosis is one of the key targets of the Sustainable Development Goals (SDGs) by 2030 (Rosadi, 2020; Siburian et al., 2024). Approximately 90% of TB cases occur among adults, with a higher prevalence in men than women. While TB mainly affects the lungs, it can also involve other parts of the body (Laowo, 2025). In 2020, the WHO Southeast Asia Region accounted for the highest proportion of new TB cases (43%), followed by the African Region (25%) and the Western Pacific Region (18%). Furthermore, 86% of new TB cases were reported in 30 high-burden countries, with eight countries India, China, Indonesia, the Philippines, Pakistan, Nigeria, Bangladesh, and South Africa contributing nearly two-thirds of the global TB burden (WHO, 2023).

Adherence to treatment is essential during pulmonary TB therapy, as uninterrupted and consistent medication significantly increases the likelihood of complete recovery. Therefore, TB patients are required to strictly follow the prescribed treatment regimen. Medication adherence refers to an individual's behavior in following medical recommendations, including taking medication as prescribed, maintaining dietary instructions, and implementing lifestyle modifications in accordance with treatment guidelines. Adherence encompasses the degree to which patients comply with all components of the treatment plan (Wulandini et al., 2020). Non-adherence in TB treatment represents a complex and multifaceted healthcare challenge involving patient-related factors, treatment-related issues, and healthcare provider factors. Poor adherence reduces the effectiveness of pharmacological therapy and contributes to increased drug resistance, such as multidrug-resistant tuberculosis (MDR-TB), higher mortality rates, and greater social and economic burdens (Hassani et al., 2023).

Compliance with anti-tuberculosis drug (OAT) therapy is a critical determinant of TB treatment success. Adequate adherence is necessary to prevent the development of MDR-TB, a condition in which TB becomes resistant to standard OAT regimens, requiring more complex and prolonged antibiotic treatment (Winarni et al., 2019; Siburian et al., 2024). Individuals infected with drug-resistant TB bacteria may develop MDR-TB, and transmission of these resistant strains can occur from MDR-TB patients to the surrounding community (Suryatinah & Sulasmi, 2021).

Effective TB treatment outcomes depend heavily on patients' adherence to prescribed treatment protocols (Saragih & Sirait, 2020). One indicator of medication adherence among TB patients is attendance at follow-up visits after receiving recommendations for subsequent examinations. Patients are considered adherent if they take their medication according to the instructions provided on the drug packaging and consume the medication on schedule. Treatment success in pulmonary TB patients is strongly influenced by medication adherence. Several factors have been identified as influencing adherence, including age, knowledge, availability of free time, supervision, type and dosage of medication, occupation, attitudes, and counseling provided by healthcare workers (Siburian et al., 2024).

There are several theories related to medication adherence according to Gibson's (1996) theory in Arifin (2020), namely demographic factors (age, gender, education

level, length of service, distance, and marital status), organizational factors, psychological factors (level of knowledge, perception, personality, and motivation), and economic factors. Meanwhile, according to Niven's (2002) theory in Arifin (2020), namely individual factors and beliefs, family support factors, social support, and support from health workers.

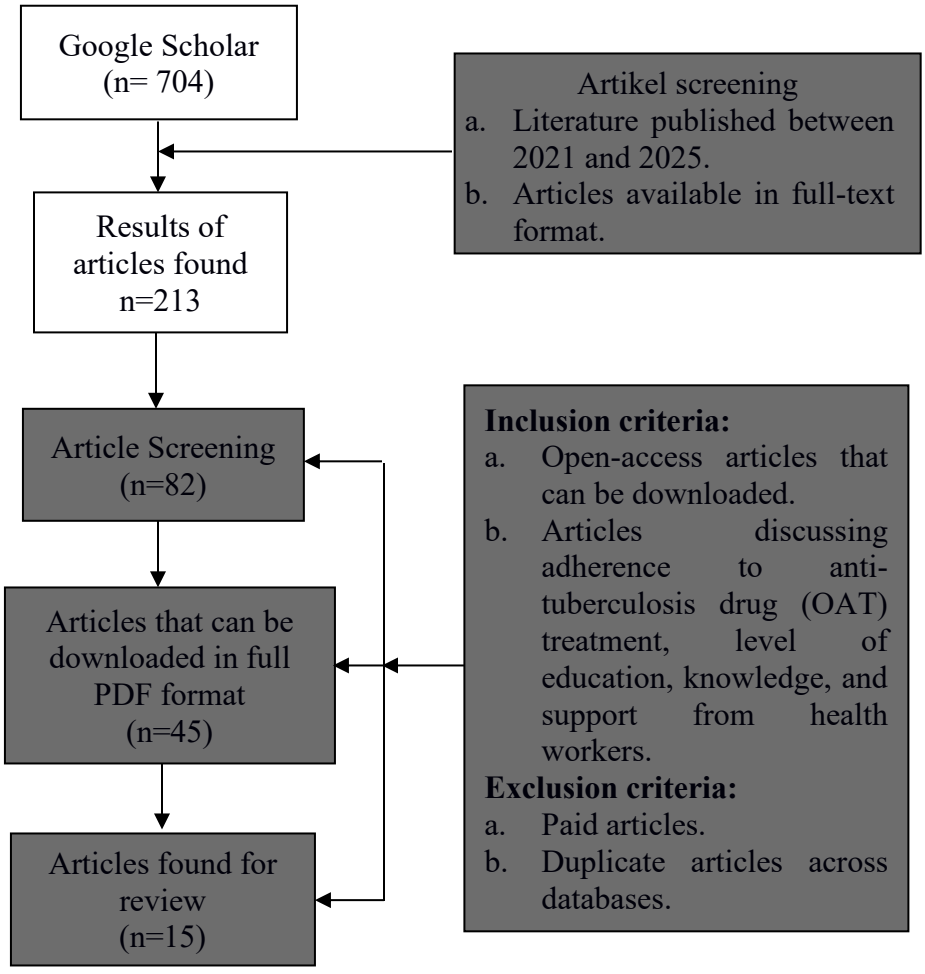
2. Method

This study is a literature review. Articles were identified through database searches conducted using Google Scholar. The selection of literature to be reviewed was determined based on predefined inclusion and exclusion criteria as follows:

Inclusion criteria:
a. Literature published between 2021 and 2025.
b. Articles available in full-text format.
c. Open-access articles that can be downloaded.
d. Articles discussing adherence to anti-tuberculosis drug (OAT) treatment, level of education, knowledge, and support from health workers.

Exclusion criteria:
a. Paid articles.
b. Duplicate articles across databases.

Subsequently, the researchers determined the keywords using Medical Subject Headings (MeSH). For international journals, the keywords used were “compliance with taking anti-tuberculosis drugs (OAT)” AND “level of education” AND “knowledge” OR “support from health workers”. The results of the search that went through the selection process are presented in Figure 1.



3. Result

Based on the results of a literature search from various databases such as Google Scholar within the period of 2021–2025, fourteen articles met the inclusion criteria and were relevant to the topic of adherence to anti-tuberculosis drug treatment. These articles discussed various factors influencing adherence to anti-tuberculosis medication, including level of education, knowledge, and support from health workers, as presented in the following table.

Table 1. Results of the Review of 14 Articles

No	Researcher's Name	Title	Research Results	Findings
1.	Nugroho *et al.* (2025)	Factors That Influence Medication Compliance In Pulmonary Tuberculosis Patients	Research results show that knowledge, attitude, family support, and health worker support had a significant relationship with patient compliance ($p < 0.05$). Health worker support was a dominant factor with an Exp(B) value of 28.7, which means that patients with good health worker support have a 28.7 times greater chance of compliance. In contrast, access to health services did not show a significant relationship ($p > 0.05$).	The findings indicated that patients' knowledge, attitudes, family support, and support from health workers were significantly associated with medication compliance among pulmonary tuberculosis patients. Among these variables, support from health workers emerged as the most dominant factor influencing adherence. Conversely, access to health services was not found to have a significant relationship with treatment compliance.
2.	Adima & Arini (2025)	The influence of healthcare workers' social support on compliance to medication in multi drug resistant tuberculosis patients at the Regional General Hospital of Dr. Saiful Anwar	Research results show that based on the crosstabulation analysis using the contingency coefficient, only education was significantly associated with medication adherence ($p < 0.01$). Bivariate analysis showed that emotional, informational, instrumental, and appraisal support were associated with medication adherence ($p < 0.25$) and were therefore included in the multivariate analysis. The Chi-square test indicated that the calculated χ^2 value (29.791) was greater than the table value (9.488) at df = 4, with $p = 0.000$ (< 0.05), indicating that the inclusion of independent variables significantly improved the model. Multivariate analysis revealed that instrumental support was the most influential factor associated with medication adherence ($p < 0.05$). Based on the Odds Ratio (Exp[B]), emotional support increased adherence by 0.663 times, informational support by 3.623	The findings showed that education level was significantly associated with medication adherence among MDR-TB patients. Various forms of healthcare workers' social support including emotional, informational, instrumental, and appraisal support were related to adherence, with instrumental support identified as the most influential factor in improving medication compliance.

No	Researcher's Name	Title	Research Results	Findings
			times, instrumental support by 0.047 times, and appraisal support by 1.690 times compared to individuals who did not receive these forms of support.	
3.	Silalahi *et al.* (2025)	Factors Related to Compliance in Taking Medication in Tuberculosis Patients in The Work Area of Tanjung Morawa Community Health Center, Deli Serdang Regency in 2024	Research results show that there is no significant relationship between age (p=0.077), gender (p=0.098), level of education (p=0.410), and health officers (p=0.509) with compliance to treatment. However, there are significant relationships between employment (p=0.026), family support (p=0.008), and medication supervision (p=0.005) with compliance to treatment. The variable of medication supervision has the highest Exp(B) value (7.800), indicating that this variable is the most influential factor regarding treatment compliance.	The findings revealed that employment status, family support, and medication supervision were significantly associated with treatment compliance among tuberculosis patients. Medication supervision was identified as the most influential factor affecting adherence, while age, gender, education level, and health worker factors showed no significant relationship with compliance.
4.	Laowo *et al.* (2025)	Factors Affecting Compliance with Taking Anti-Tuberculosis Drugs at the UPTD Pulmonology Hospital of North Sumatra Province	Research results show that there was an influence of knowledge on adherence to taking anti-tuberculosis drugs (p-value = 0.038), employment (p-value = 0.018), access to health services (p-value = 0.003), and family support (p-value = 0.006). There was no influence of medication's side effects on adherence to anti-tuberculosis drugs (p-value = 1) at the UPTD Pulmonology Hospital of North Sumatra Province. The dominant factor in this study was family support, which tended to be more compliant with taking anti-tuberculosis drugs by 19 times compared to respondents who received less family support.	The findings demonstrated that knowledge, employment status, access to health services, and family support significantly influenced adherence to anti-tuberculosis drug treatment. Family support was identified as the dominant factor, whereas medication side effects were not associated with patients' compliance.
5.	Siburian *et al.* (2025)	The Impact Of Clients' Knowledge On Compliance With Anti-Tuberculosis Medication At Home	Research results show that out of 10 respondents who have less knowledge with medication adherence, 8 people (80.0%) are not compliant, and 2 people are compliant (20.0%) and out of 23 respondents who have sufficient knowledge with medication adherence, 5 people are not compliant (21.7%) and 28 people are compliant	The findings indicated a significant relationship between patients' level of knowledge and compliance with anti-tuberculosis medication. Higher levels of knowledge were associated with greater adherence, suggesting that knowledge plays an important role in

No	Researcher's Name	Title	Research Results	Findings
			(78.3%). and out of 25 respondents who have good knowledge with medication adherence, 2 people are not compliant (17.1%) and 23 people are compliant (82.9%). The results of the statistical test using the chi square test with a 95% confidence level (α = 0.05) showed a p value = 0.001 in this study, namely: if the p value ≤ 0.05, then the hypothesis in this study is accepted, which means there isThe relationship between the level of knowledge of tuberculosis clients and compliance in taking anti-tuberculosis drugs at Harapan Hospital, Pematang Siantar in 2023.	improving treatment compliance among tuberculosis patients.
6.	Shoufiah (2025)	*Factors Affecting Tuberculosis Patient Compliance in Taking Medication at Dr. Yos Sudarso Hospital, Padang*	Research results show that education, family support, knowledge about TB, drug side effects, and relationship with health workers were significantly associated with patient adherence. After multivariate analysis, the most influential factors were patient knowledge about TB (OR=4.10; p=0.018) and family support (OR=3.25; p=0.032). Meanwhile, drug side effects were found to reduce the likelihood of adherence (OR=0.28; p=0.029). The relationship with healthcare personnel, although significant in bivariate analysis, was not found to be a dominant factor after controlling for other variables (p=0.165).	The findings showed that education, family support, knowledge about tuberculosis, drug side effects, and relationships with health workers were significantly associated with medication adherence. Knowledge about tuberculosis and family support were identified as the most influential factors, while drug side effects reduced the likelihood of adherence.
7.	Hutauruk *et al.* (2025)	*Determinants of Compliance in Taking Tuberculosis Medication at Garoga Health Center, Garoga District, North Tapanuli Regency in 2023*	Research results show that indicated significant associations between compliance and age (p = 0.001), gender (p = 0.006), education (p = 0.001), knowledge (p = 0.002), the role of health workers (p = 0.001), and PMO support (p = 0.002). However, no significant relationship was found between occupation and compliance (p = 0.036).	The findings revealed that age, gender, education level, knowledge, the role of health workers, and PMO (medication supervisor) support were significantly associated with compliance in taking tuberculosis medication. In contrast, occupation was not found to be significantly related to adherence.
8.	Furiyana *et al.* (2025)	Relationship Between Knowledge Level of Pulmonary	Research results show that the level of knowledge was sufficient at 44.9%, the level of	The findings indicated a significant relationship between patients'

No	Researcher's Name	Title	Research Results	Findings
		Tuberculosis Patients and Compliance In Taking Anti-Tuberculosis Drugs (OAT)	knowledge was good at 36.2%, the level of knowledge was lacking at 18.8%. And the level of compliance with taking anti tuberculosis drugs (OAT) with moderate compliance was 55.1%, high compliance was 24.6%, low compliance was 20.3%. Data analysis using Pearson Chi-Square Test with p-value result of 0.011 (p<0.005).	knowledge levels and compliance with taking anti-tuberculosis drugs. Patients with higher knowledge levels tended to demonstrate better medication adherence compared to those with limited knowledge.
9.	Fitriati *et al.* (2024)	Factors Related to Compliance in Taking Medication among Pulmonary Tuberculosis (TB) Patients	Research results show that factors related to compliance in taking medication were education level p value = 0.009, knowledge level p value = 0.001, attitude p value = 0.004, family support p value = 0.004, and access to treatment p value = 0.001.	The findings showed that education level, knowledge level, attitude, family support, and access to treatment were significantly related to medication compliance among pulmonary tuberculosis patients, highlighting the multifactorial nature of adherence behavior.
10.	Hartati *et al.* (2024)	Factors Associated with Medication Adherence in Patients with Tuberculosis Year 2024	Research results show that among the 52 respondents, age was significantly associated with tuberculosis medication adherence, with younger patients (<20 years) showing lower adherence ($p < 0.05$). No significant associations were found between adherence and education level or employment status ($p > 0.05$). In contrast, knowledge level, attitude toward treatment, history of drug side effects, role of health workers, access to health services, and family support were all significantly associated with medication adherence ($p < 0.05$). Patients with low knowledge, negative attitudes, a history of drug side effects, limited support from health workers, poor access to health services, and lack of family support were more likely to be non-adherent to tuberculosis treatment.	The findings demonstrated that age, knowledge level, attitude toward treatment, history of drug side effects, the role of health workers, access to health services, and family support were significantly associated with medication adherence. Younger patients were more likely to be non-adherent, while education level and employment status were not significantly related to adherence.
11.	Adini *et al.* (2023)	Relationship between Knowledge, Attitudes, and Motivation and Compliance to Taking Anti-Tuberculosis	Research results show that it was obtained that 95% (57) of the respondents had good knowledge, 73% (44) of the respondents had good attitude, 72% (43) had good motivation, and 51.7% (31) of the respondents were adherent in	The findings indicated that the level of knowledge was significantly associated with compliance in taking anti-tuberculosis medication. However, attitudes and motivation were not found to have a

No	Researcher's Name	Title	Research Results	Findings
		Medication on the Pulmonary TB Patient	taking medication. Furthermore, based on the results of statistical analysis using the Chi-Square test it showed that attitude and motivation variables were not significantly related to medication compliance (p-value >0.05), while the level of knowledge was significantly related to medication compliance (p-value < 0.05).	significant relationship with medication adherence among pulmonary tuberculosis patients.
12.	Yani *et al.* (2023)	Factors Related to Complying with Anti-TB Medications Among Drug-Resistant Tuberculosis Patients in Indonesia	Research results show that health behavior (r = 0.36) was positively associated with complying with anti-TB medications, while TB stigma, knowledge, and family support were not related to medication adherence	The findings showed that health behavior was positively associated with adherence to anti-tuberculosis medication among drug-resistant tuberculosis patients. In contrast, tuberculosis stigma, knowledge, and family support were not significantly related to medication compliance
13.	Safarianti *et al.* (2021)	The Influence of Knowledge and Attitude Factors on Compliance with Drinking Oat (Anti-Tuberculosis Drugs) In Patients with Lung Tuberculosis in the Regional Public Hospital, dr. Husni Thamrin Natal Sumatera Utara	Research results show that knowledge (p value = 0,000) and attitude (p value = 0,000) related to OAT drinking compliance.	The findings stated that the knowledge and attitudes affected OAT drinking compliance of the TB outpatient in RSUD dr. Husni Thamrin Natal, Mandailing Natal Regency.
14.	Tarigan *et al.* (2021)	Analysis of Education and Family Support Factor on Compliance with Taking Anti Tuberculosis Drugs (OAT) in Pulmonary Tuberculosis (TB) Patients in Tebing Tinggi City	Research results show that The results of multivariate analysis with multiple Poisson regression (p< 0.05) showed that education (p=0.043; PR=1.539, 95%CI 1.013 2.338) was associated with compliance with taking OAT in Tebing Tinggi City. Family support (p=0.008; PR=1.737, 95%CI 1.158 2.604) was associated with compliance with taking OAT in Tebing Tinggi City	The findings indicated that education level and family support were significantly associated with compliance in taking anti-tuberculosis drugs. Patients with higher education levels and stronger family support showed better adherence to treatment.

4. Discussion

4.1 Education level

The findings of this literature review indicate that the level of education plays an important role in influencing compliance with anti-tuberculosis drug (OAT) treatment, although its effect is not consistently significant across all studies. Several studies reported a significant association between education level and medication adherence (Adima & Arini, 2025; Fitriati et al., 2024; Hutauruk et al., 2025; Tarigan et al., 2021). Patients with higher educational attainment tended to

demonstrate better compliance, which may be attributed to their greater ability to understand treatment instructions, disease processes, and the consequences of non-adherence.

However, other studies found no significant relationship between education level and adherence (Silalahi et al., 2025; Hartati et al., 2024). This inconsistency suggests that formal education alone may not be sufficient to ensure compliance. In some cases, patients with lower educational backgrounds were still able to adhere to treatment when supported by strong family involvement, effective health education, or close supervision from healthcare providers. Overall, education appears to function as a facilitating factor rather than a direct determinant of adherence. Its influence on treatment compliance is likely mediated by other variables, such as knowledge acquisition, attitudes toward treatment, and access to information provided by healthcare workers.

4.2 Knowledge

Knowledge emerged as one of the most consistent and influential factors affecting adherence to anti-tuberculosis medication. Most of the reviewed studies reported a significant relationship between patients' level of knowledge and treatment compliance (Nugroho et al., 2025; Laowo et al., 2025; Siburian et al., 2025; Shoufiah, 2025; Hutauruk et al., 2025; Fitriati et al., 2024; Adini et al., 2023; Safarianti et al., 2021). Patients with adequate or good knowledge regarding tuberculosis, treatment duration, medication schedules, and the risks of discontinuing therapy were more likely to adhere to OAT regimens. The relationship between knowledge and medication compliance in this study supports the previous research (Gashu et al., 2021; Sahputri & Khairunnisa, 2022) and can provide implications that good patient knowledge regarding TB prevention and transmission methods encourages and needs to be emphasized in the need for ongoing public education regarding TB prevention, treatment, and care (Adisa et al., 2021).

Higher levels of knowledge enable patients to better understand the importance of completing treatment, even when symptoms improve or side effects occur. This understanding reduces the likelihood of treatment interruption, which is a major contributor to treatment failure and the development of drug-resistant tuberculosis. Several studies also demonstrated a dose response pattern, in which adherence increased progressively with higher knowledge levels (Siburian et al., 2025; Furiyana et al., 2025). Nevertheless, one study reported that knowledge was not significantly associated with adherence among drug-resistant TB patients (Yani et al., 2023). This finding suggests that in more complex treatment contexts, such as MDR-TB, behavioral and psychosocial factors may outweigh knowledge alone. Despite this exception, the overall evidence strongly supports knowledge as a key determinant of medication compliance in pulmonary TB patients.

4.3 Healthcare support

Support from healthcare workers was identified as a crucial factor influencing adherence to anti-tuberculosis treatment. Several studies demonstrated that patients who received adequate support from health professionals such as counseling, supervision, motivation, and clear communication were significantly more compliant with medication regimens (Nugroho et al., 2025; Hutauruk et al., 2025; Hartati et al., 2024).

In some studies, healthcare worker support was identified as the most dominant factor affecting adherence. Nugroho et al. (2025) reported that patients with strong support from health workers were significantly more likely to comply with treatment. Similarly, Adima and Arini (2025) found that instrumental support provided by healthcare workers played a major role in improving adherence among MDR-TB patients.

Healthcare workers act not only as providers of medical treatment but also as sources of

information, emotional encouragement, and motivation. Effective interaction between patients and healthcare providers enhances trust, improves understanding of treatment instructions, and helps patients manage side effects. Conversely, inadequate communication or limited follow-up may reduce adherence, even among patients with good knowledge. These findings emphasize that healthcare worker support is a modifiable and strategic factor that can be strengthened through patient-centered care, regular counseling, and active treatment supervision.

In summary, this literature review demonstrates that knowledge and support from healthcare workers are the most consistently influential factors in determining compliance with anti-tuberculosis drug treatment, while education level plays a supportive but indirect role. Strengthening patient education, improving communication, and enhancing the role of healthcare workers in monitoring and supporting patients are essential strategies to improve treatment adherence and prevent drug resistance.

5. Conclusion And Suggestion

This literature review concludes that knowledge and support from healthcare workers are the most influential factors affecting compliance with anti-tuberculosis drug (OAT) treatment. Adequate knowledge improves patients' understanding of the importance of completing therapy, while healthcare worker support enhances motivation, supervision, and adherence. The level of education has an indirect role, as it facilitates understanding but does not independently determine compliance.

Suggestions that can be given are healthcare providers should strengthen patient education and supportive communication throughout the treatment process. Tuberculosis control programs are encouraged to enhance the role of healthcare workers in counseling and treatment supervision. Future research should explore other psychosocial and contextual factors influencing medication adherence, particularly in drug-resistant tuberculosis patients.

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