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ORIGINAL ARTICLE

Analysis of Factors Influencing Medication Adherence Behavior Among Pulmonary Tuberculosis Patients

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ABSTRACT

Background: Pulmonary tuberculosis (TB) remains a major public health problem because poor medication adherence can lead to treatment failure, continued transmission, and drug-resistant TB. Therefore, this study aims to analyze the factors influencing medication adherence behavior among pulmonary tuberculosis patients

Methods: This study employed an analytic observational design with a cross-sectional approach involving pulmonary tuberculosis patients undergoing treatment at public health centers in Jambi City, with 105 respondents selected through consecutive sampling. Knowledge, attitudes, and family support were measured using structured questionnaires to assess their association with medication adherence, and data were analyzed using the chi-square test at a significance level of $p < 0.05$.

Results: The findings revealed that more than half of the respondents were not compliant with TB treatment (56.2%). Most participants demonstrated limited knowledge (65.7%) and unfavorable attitudes toward treatment (61%), although a majority reported receiving family support (68.6%). Statistical analysis identified significant associations between medication adherence and knowledge (PR = 4.609; p = 0.000), attitude (PR = 1.722; p = 0.008), and family support (PR = 1.175; p = 0.012). **Conclusion:** Knowledge, attitude, and family support were significantly related to treatment adherence among pulmonary TB patients in Jambi City in 2024. These results underscore the need for comprehensive TB education initiatives, enhanced communication skills among health workers, and stronger implementation of the DOTS strategy, including digital reminder tools, to improve patient adherence.

Keywords: Tuberculosis, Medication Adherence, TB Patients

INTRODUCTION

Tuberculosis is a long-term infectious disease that strongly illustrates the link between poor treatment adherence and the development of drug resistance. (1) Tuberculosis can attack the lungs and can affect all parts of the body. This disease has been known to the public for a very long time. It is widely assumed that close to one-third of the global population has been exposed to and infected by *Mycobacterium tuberculosis.(2*)*

Extrapulmonary tuberculosis accounts for approximately 20-30% of all active TB cases and affects primarily children and adults with weakened immune systems.(3) Nearly a quarter of the world's population is infected with pulmonary tuberculosis, but the disease may not develop in some people.(4) According to 2023 World Health Organization (WHO) data, pulmonary tuberculosis is categorized as the second most deadly infectious disease after Covid-19.

About 10.6 million people worldwide were afflicted with pulmonary tuberculosis in 2022; of these, 5.8 million were men, 3.5 million were women, and 1.3 million were children. Global efforts to combat pulmonary tuberculosis began in 2000 and have saved 75 million lives.(5) Based on the results of the 2023 Indonesian Health Survey (SDKI), the prevalence of pulmonary tuberculosis was 0.3% with a total of 877,531 cases. TB examination/diagnosis was carried out through sputum examination (70.4%), chest x-ray (68.2%), mantoux test (9.1%), and Igra (6.5%).

Meanwhile, therapy was given through KDT (fixed dose combination, which is a drug package for one treatment period) with a proportion of 61.3%, Combipak (27.3%), Release (16.7%), and Injection (5.8%), the proportion of National Drug Swallowing Supervisors was 61.2% (weighted N = 2,435).The highest number of cases of pulmonary tuberculosis were in the 25-34 year age group, namely 140,206 cases, followed by the 15-24 year age group, namely 139,891 cases and the 5-14 year age group, namely 138,465 cases.(6)

According to records from the Jambi Provincial Health Office, a total of 5,308 tuberculosis cases were reported in 2022, comprising 3,206 males and 2,102 females from a population of 3,642,723. In the same year, the tuberculosis incidence rate in Jambi Province reached 425 cases per 100,000 population, while the mortality rate was recorded at 6 deaths per 100,000 population.(7)

According to data from the Jambi City Health Office, out of 612,795 residents, 1,810 tuberculosis patients underwent treatment in 2023. Of them, 892 had bacteriological confirmation and 918 had a clinical diagnosis.(8) These challenges are particularly evident in Jambi province, which has a high burden of active TB, where both in the community and in hospitals, many cases of active TB and drug-resistant TB remain undiagnosed.(9)

Medication compliance is the behavior of following a doctor's advice or a doctor's actions regarding the use of medication, which is preceded by a negotiation process between the patient and the doctor as the provider of medical services.(10) Compliance with anti-tuberculosis medication involves taking the prescribed medication at the correct time and dosage. Treatment will only be effective if the patient adheres to the medication instructions.(11)

Treatment for pulmonary tuberculosis patients aims to cure the patient, prevent death, and prevent drug resistance. However, the lengthy treatment period (6-8 months), the use of various medications, and the associated side effects, can lead to patient non-compliance.(12) Due to the potential for drug resistance, disease recurrence, and even mortality, non-compliance with treatment is frequently a worldwide issue.(12) Some things that cause obstacles in the treatment of pulmonary tuberculosis include older age. (13)

Factors that influence patient compliance behavior in taking medication are predisposing factors, including knowledge, patient attitudes, beliefs, and education; enabling factors, including the attitudes of officers, community leaders, religious leaders, and regulations or norms; and reinforcing factors, namely family support, health facilities, and distance to health facilities.(14)

Other factors related to the risk of tuberculosis recurrence are age, gender, education level and household contact with TB sufferers.(15) Individuals with higher levels of education tend to understand the importance of health.(16) Education is something that is very important and needed and must be obtained by all human beings, because the higher a person's education, the more information they receive and have.(17) This study aims to analyze the factors influencing medication adherence behavior among pulmonary tuberculosis patients in Jambi City in 2024.

METHOD

This research adopted an analytic observational framework employing a cross-sectional methodology. The study was carried out between August and December 2024 across ten Community Health Centers (Puskesmas) in Jambi City, which were chosen based on having the highest burden of pulmonary tuberculosis cases in each sub-district. The target population comprised pulmonary tuberculosis patients receiving treatment in Jambi City who fulfilled the established inclusion and exclusion criteria. From a total of 491 eligible patients, 105 participants were selected through consecutive sampling, with the sample size proportionally allocated to each health center. Information was gathered using a standardized questionnaire covering variables of knowledge, attitudes, family support, and adherence to anti-tuberculosis medication. Statistical analysis was conducted using the chi-square test, with

statistical significance determined at p < 0.05. Ethical clearance for this study was granted by the Ethics Committee under approval number 2511/UN21.8/PT.01.04/2024.

RESULT

The results of this study describe the distribution and relationship of knowledge, attitudes, and family support with medication adherence among pulmonary tuberculosis patients in Jambi City in 2024. The findings are presented in detail in the tables below.

Table 1. Relationship between Knowledge and Medication Compliance in Pulmonary Tuberculosis Patients in Jambi City

Knowledge	Medication Complience				Total		P Value	PR (95%CI)
	Not Obey		Obedient					
	n	%	n	%		%		
Not Enough	53	76.8	16	23.2	69	100	0.000	**4.609 (2.195-9.677)**
Enough	6	16.7	30	83.3	36	100		
Total	59	56.2	46	43.8	105	100		

Based on the results of the chi-square test, a p-value of 0.000 (p < 0.05) indicated a significant association between knowledge and medication adherence among pulmonary tuberculosis patients in Jambi City in 2024. Respondents with insufficient knowledge had a 4.6 times higher risk of non-adherence to treatment compared to those with adequate knowledge (PR = 4.609; 95% CI: 2.195–9.677). One of which is adherence to tuberculosis therapy.

The results indicate that medication adherence among pulmonary tuberculosis patients in Jambi City in 2024 differed according to patients' attitudes, as shown in the Table 2.

Table 2. Relationship between Attitude and Medication Compliance in Pulmonary Tuberculosis Patients in Jambi City

Attitude	Medication Complience				Total		P Value	PR (95%CI)
	Not Obey		Obedient					
	n	%	n	%		%		
Negative	43	67.2	21	32.8	64	100	0.008	1.722 (1.132-2.618)
Positive	16	39	25	61	41	100		
Total	59	56.2	46	43.8	105	100		

Based on the results on table 2, the majority of non-adherent pulmonary tuberculosis patients had negative attitudes (67.2%) compared to those with positive attitudes (39%). The chi-square test showed a significant relationship between attitude and medication adherence (p = 0.008). Patients with negative attitudes were 1.72

times more likely to be non-compliant with treatment than those with positive attitudes (PR = 1.722; 95% CI: 1.132–2.618).

The results indicate that medication adherence among pulmonary tuberculosis patients in Jambi City in 2024 differed according to the level of family support, as shown in the Table 3.

Table 3. Relationship between Family Support and Medication Compliance in Pulmonary Tuberculosis Patients in Jambi City

Family Support	Medication Complience				Total		P Value	PR (95%CI)
	Not Obey		Obedient					
	n	%	n	%		%		
Less Supportive	25	75.8	8	24.2	33	100	0.012	**1.604 (1.175-2.190)**
Supportive	34	47.2	38	52.8	71	100		
Total	59	56.2	46	43.8	105	100		

Based on the chi-square results, a p-value of 0.012 ($p < 0.05$) indicated a significant association between family support and medication adherence among pulmonary tuberculosis patients in Jambi City in 2024. Patients with lower family support had a 1.6 times higher risk of non-adherence compared to those receiving adequate family support (PR = 1.604; 95% CI: 1.175–2.190).

DISCUSSION

Based on Table 1, the findings indicate that knowledge plays an important role in medication adherence among pulmonary tuberculosis patients in Jambi City in 2024. Adequate knowledge enables patients to better understand the disease process, the importance of completing treatment, and the potential consequences of non-adherence, which in turn supports consistent use of anti-tuberculosis drugs. Increased knowledge can indirectly influence patients' attitudes and motivation to adhere to therapy, as individuals with better health-related knowledge tend to adopt healthier behaviors and demonstrate greater commitment to long-term treatment.

Knowledge is the main factor that influences each individual in their attitudes and goals to be achieved, one of which is adherence to tuberculosis therapy. Increased knowledge will indirectly trigger changes in patient insight and attitudes to survive against the tuberculosis they experience.(18) The patient's knowledge can influence the patient's understanding of pulmonary TB disease, the lower the level of knowledge about health, the less understanding of a disease, so that with high knowledge it will support compliance in taking Anti-Tuberculosis Drugs (OAT).(19)

A person who has a lot of broad knowledge will be better at living a healthy life.17 A person with high knowledge has high self-awareness of health and has high

motivation to get well.(20) The knowledge level of TB patients includes an understanding of the disease, how it is transmitted, its symptoms, and the importance of consistent and timely recovery. Patients are often better able to understand the importance of taking their medication consistently and sticking to their doctor's prescribed treatment regimen if they have a solid understanding of TB. (21)

From the table 1The results of this study are in line with a study by Hasina et al. (2023) that found a substantial correlation between pulmonary tuberculosis patients' adherence to anti-tuberculosis medication and their level of knowledge. The study found a significant association between patient awareness and medication compliance among pulmonary TB patients in the service area of the Tanah Kali Kedinding Health Center, Surabaya City, with a value of $\rho < \alpha$ (0.03 < 0.05) using the Spearman Rank correlation test.(22) The results of this study are also consistent with research conducted in 2021 by Dwiningrum et al., which shown a strong correlation between medication adherence and knowledge among tuberculosis patients at the Harum Melati Clinic. A significant link was indicated by the statistical analysis's p-value of 0.001, which was less than the significance level of 0.05. With an odds ratio of 6.000 (95% CI: 2.453–14.678), patients with less understanding were six times more likely than those with strong knowledge to not comply with their treatment.(18)

Knowledge and medicine adherence are related in pulmonary tuberculosis patients in Jambi City in 2024, according to the findings of earlier research, theories, and studies. This is because one of the supports for the success of pulmonary TB treatment is knowing how far the patient's knowledge about pulmonary TB, the symptoms of pulmonary TB and how it is transmitted is absolutely understood. Because at this stage, prevention of pulmonary TB can be done or at least the patient's disease can be detected early so that the treatment will be carried out not too long and has a smaller risk of failure.(23) Education and outreach to the community increases public knowledge and understanding of extrapulmonary tuberculosis, so that it can ultimately become part of efforts to prevent the disease and reduce the incidence of TB.

From Table 2, the findings suggest that patients' attitudes play an important role in shaping medication adherence among pulmonary tuberculosis patients in Jambi City in 2024. Attitude reflects patients' perceptions, beliefs, and readiness to follow long-term treatment, which can influence their commitment to completing anti-tuberculosis therapy. Negative attitudes toward treatment may reduce motivation and consistency in taking medication, whereas positive attitudes encourage patients to comply with treatment recommendations. Supportive environments, including encouragement and supervision from family members or

treatment supporters, may help foster more positive attitudes and strengthen patients' adherence to therapy, ultimately contributing to better treatment outcomes

Attitude is a crucial domain for shaping a person's behavior. If a person with pulmonary tuberculosis has a poor attitude toward managing their disease, they will experience obstacles in their healing process. Patients with good adherence can prevent acute complications and reduce the risk of long-term complications.(24)

A person's inclination or willingness to behave is reflected in their attitude, which is crucial in determining their conduct. When it comes to health, a positive outlook is more likely to promote good habits, whereas a negative outlook is more likely to result in unhealthy habits.(25) This positive attitude is determined by a person's education and knowledge. Attitudes shape responses of acceptance, belief, appreciation, and responsibility in performing acts of obedience. A person's attitude reflects their response to a behavior. Attitude is a predisposition used to respond positively or negatively to objects, situations, concepts, and people. 26

The findings of this study are consistent with research done in 2021 by Listyarini and Heristiana, who discovered a strong and favorable relationship between TB patients' views and adherence to anti-tuberculosis medication. This correlation indicates that higher attitudes lead to increased adherence to treatment. This strong correlation is characterized by attitudes as beliefs that a person believes in when carrying out an action. (26)

The results of this study were also supported by Ratu et al. in 2021, who stated that based on the results of the analysis test, a significant value of p = 0.001 <0.05 was obtained, which means there is a significant influence between attitudes and patient compliance in taking anti-tuberculosis medication at the Tarus Community Health Center, Kupang Regency, with a correlation coefficient value of T = 0.132. According to the researchers, these results indicate a positive correlation between attitudes and patient compliance in taking anti-tuberculosis medication at the Tarus Community Health Center, Kupang Regency, with a fairly strong influence. This also explains that if the patient's attitude is good, the patient will be compliant in taking anti-tuberculosis medication. Where in this study, the patient's attitude towards taking anti-tuberculosis medication was in accordance with the recommendations of health workers, such as patients coming to pick up medication according to the schedule for taking medication, taking medication regularly, avoiding triggering factors that can worsen symptoms, so that in patient compliance, it was found that they did not forget to take medication according to the prescription and the specified amount.. (24)

It may be concluded that attitudes and medication adherence in pulmonary

tuberculosis patients in Jambi City in 2024 are related based on the findings of earlier research, theories, and studies. This is because a good attitude from patients can also have a positive impact on patient compliance in taking anti-tuberculosis medication. Where through a good attitude from patients will influence objects or situations related to them, so that the intention arises towards something that is being carried out, such as carrying out a tuberculosis treatment program in the form of taking medication regularly and how to take medication according to the correct dosage.

From Table 3, the findings indicate that family support plays an important role in medication adherence among pulmonary tuberculosis patients in Jambi City in 2024. Family members act not only as sources of emotional and practical support but also as treatment supervisors who remind and encourage patients to take anti-tuberculosis medication regularly until completion of therapy. Support from close relatives such as spouses, parents, siblings, or children can strengthen patients' motivation and sense of responsibility toward treatment. Adequate family support helps patients overcome treatment fatigue and forgetfulness, thereby improving adherence and contributing to better treatment outcomes.

Family support plays a crucial role in supporting TB patient medication adherence. In addition to their role as supporters, families also act as Medication Supervisors (PMOs), who will then remind patients to continue taking their medication until the completion of the program. This family support comes from close relatives such as daughters, brothers, sisters, mothers, wives, or husbands. The attention and support of families in supervising and reminding patients to take their medication can accelerate the healing process and improve the health status of TB patients. (24)

Family support is thought to mitigate the effects of an individual's mental health if the family supports each other in addressing the various conditions the patient is experiencing. Family members can offer support in a variety of ways, including presenting pertinent information, providing practical help, offering emotional support, and expressing gratitude or acknowledgment. These types of assistance have a significant impact on how well patients comprehend their illness and how consistently they adhere to tuberculosis treatment.(27)

Family involvement is closely associated with medication adherence among tuberculosis patients. Ideally, the treatment supervisor (PMO) comes from within the family, such as a spouse or child, as they are generally more trusted. Strong emotional ties enhance the effectiveness of the PMO, who not only ensures regular medication intake but also offers emotional encouragement to the patient.19 The results of this study are consistent with a 2022

study by Mantovani and colleagues that showed a strong correlation between medication adherence and family participation in tuberculosis patients. The link was statistically significant at a significance level below 0.05, according to their chi-square test analysis, which yielded a p-value of 0.008.(28)

Information that is purposefully given to people who want to boost their self-confidence might increase self-efficacy by reassuring them that the difficulties they face are doable. When support is given to individuals who are capable and open to learning new things, it can spur them to work more and develop self-confidence.(29). The results of this study are in line with a 2024 study by Alhaq and Indawati that found a strong correlation between medication adherence and family support. Their chi-square analysis yielded a p-value of 0.016, suggesting a moderately strong and significant association.27 Based on previous research and pertinent theoretical frameworks, it can be concluded that treatment adherence among pulmonary tuberculosis patients in Jambi City in 2024 is correlated with patient attitudes. The function of the family, which is the main source of support for those dealing with health challenges, is intimately related to this relationship. Helping ailing family members with various sorts of support, such as encouragement and supervision in taking prescribed drugs, is one of the most important family roles.

Overall, the discussion demonstrates that medication adherence among pulmonary tuberculosis patients in Jambi City in 2024 is closely influenced by multiple interrelated factors, including knowledge, attitudes, and family support. Adequate knowledge enhances patients' understanding of the disease and treatment, positive attitudes strengthen motivation and commitment to long-term therapy, and strong family support reinforces adherence through supervision, encouragement, and emotional assistance. Together, these factors play a significant role in supporting successful tuberculosis treatment and highlight the importance of comprehensive, patient-centered, and family-involved approaches in tuberculosis control programs.

Despite these findings, this study has several limitations that should be considered. The cross-sectional design limits the ability to determine causal relationships between the identified factors and medication adherence. In addition, the use of self-reported questionnaires may introduce recall bias and social desirability bias, potentially affecting the accuracy of the responses. Furthermore, the study was conducted only in public health centers in Jambi City, which may limit the generalizability of the findings to other settings or populations.

CONCLUSION

Based on the results, most respondents were aged 20–35 years, male, had higher education, and worked in the private or labor sector. More than half were non-adherent to treatment, had low knowledge, negative attitudes, and received family support. There is a correlation between knowledge and medication adherence (p = 0.000), attitude and medication adherence (p = 0.008), and family support and medication adherence (p = 0.012) among pulmonary tuberculosis patients in Jambi City in 2024, with knowledge showing the strongest association.

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