

Factors Associated with Adherence to Taking Medication in Tuberculosis Patients at Lawawoi Health Center, Sidenreng Rappang Regency

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ABSTRACT

Introduction: Tuberculosis (TB) is an infectious disease that remains a global public health problem, including in the working area of Lawawoi Health Center, Sidenreng Rappang Regency. This study aims to determine the relationship between factors such as income, attitude, knowledge, habits, and the role of health workers with adherence to taking medication in TB patients. **Methods:** This study used a quantitative approach with an observational analytic design and cross-sectional method. A sample of 40 respondents was selected using simple random sampling technique. Data collection was done through questionnaires, and data analysis using the Chi-square test. **Results:** The statistical test results showed that there was no significant relationship between income ($p=0.462$), attitude ($p=0.065$), knowledge ($p=0.083$), habits ($p=0.347$), and the role of health workers ($p=0.577$) with adherence to taking medication in TB patients (all $p > 0.05$). **Conclusion:** There was no significant association between income, attitude, knowledge, habits, and the role of health workers with medication adherence in TB patients. Nevertheless, this finding is expected to serve as a reference for health workers in developing more effective educational strategies and interventions to improve TB treatment success.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* and affects the lungs and other organs such as the spine, brain, and kidneys. The disease is still a global and national health problem, included in the top 10 causes of death in the world (Nurqanita et al., 2024). According to the *World Health Organization* (WHO), TB is an infectious disease with a high mortality burden. By 2022, WHO reports that approximately 10.9 million new TB cases will occur globally, with 1.4 million deaths. Indonesia alone

accounts for 10% of the total cases and ranks second with the highest TB burden after India (Dewi et al., 2024).

Nationally, the number of TB cases in Indonesia showed a sharp increase from 393,323 cases in 2020 to 733,084 cases in 2023, reflecting a jump of 86.4% in the last three years. South Sulawesi province is one of the regions contributing the highest number of cases. In 2020, 31,022 TB cases were reported, but only 14,808 were identified, indicating a large detection gap (BPS South Sulawesi, 2020). Specifically in the working area of the Lawawoi Health Center, Sidenreng Rappang District, TB cases have also experienced a spike. Based on secondary data from 2024, the number of suspected TB cases increased from 496 cases in 2023 to 839 cases in 2024 (69.15% increase). In addition, patients who were confirmed positive and undergoing treatment increased from 51 to 67 cases, or about 31.37% (Lawawoi Health Center secondary data, 2024). This indicates that Lawawoi Health Center faces a substantial TB caseload and has the potential to become a new source of transmission in the community if not properly addressed. This data shows an increasing trend in the TB burden at Lawawoi Health Center, as illustrated in the annual graph used by researchers in the final report.

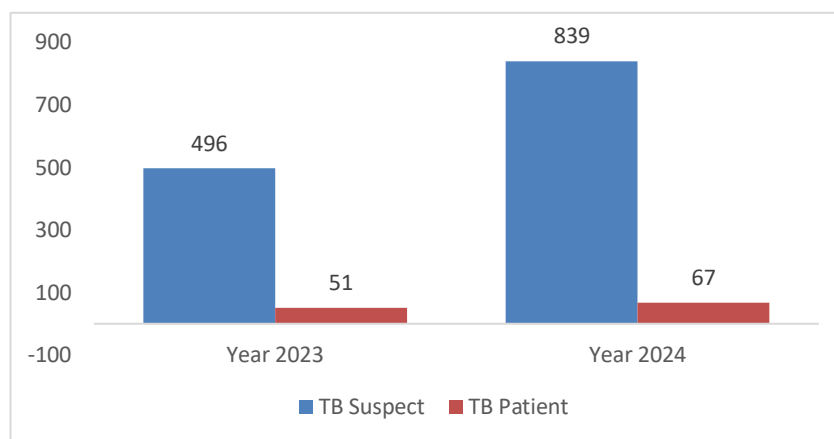


Figure 1 Graph of TB incidence rates at Lawawoi Health

One of the main challenges in TB control is the low level of patient adherence to treatment, which lasts for at least 6 months. Non-adherence can lead to drug resistance, relapse, and further transmission. In Indonesia, the compliance rate in 2023 was recorded at 86%, still below the WHO target of 90% (Ratu Suryantari & Irnawati, 2021). Some common causes of non-adherence include drug side effects, discomfort, forgetfulness due to busyness, and lack of understanding of the importance of treatment.

Various studies have shown that several internal and external factors influence medication adherence, such as income, attitude, knowledge, daily habits, and support from health workers. However, there is limited research that examines the relationship between these five factors simultaneously in the context of high TB burden areas, especially at the puskesmas level such as Lawawoi Health Center.

Based on this, the problem formulation in this study is: "Is there a relationship between income, attitude, knowledge, habits, and the role of health workers on adherence to taking medication in TB patients at the Lawawoi Health Center, Sidenreng Rappang District?" This study is important because it can provide a more concrete and data-driven local picture of the factors that influence the success of TB treatment, and help more targeted intervention efforts in the work area of the health center.

LITERATURE REVIEW

Tuberculosis

The bacterium *Mycobacterium tuberculosis* causes tuberculosis, a chronic infectious disease. Transmission occurs through droplets when people with TB cough or sneeze (Tamunu et al., 2022). According to WHO, medication adherence is an extension of medication use behavior, which includes following a specific diet and/or making lifestyle changes in accordance with advice agreed upon with health workers (Lailatushifah, 2021). Tuberculosis treatment takes between six to eight months, but there are a number of patients who do not comply and stop treatment before the end of the prescribed period. This non-compliance results in low cure rates, increased relapse rates, and the emergence of drug resistance, which can lead to therapeutic failure and Multi Drug Resistance (MDR) conditions (Sri Mulyani, 2024).

Revenue

The economic aspect of the community is closely related to their ability to pay for health care, where groups with low economic status are at risk of incomplete treatment, potentially becoming a source of disease transmission for others. These socio-economic conditions pose a major challenge for countries with the highest tuberculosis case rates in the world, such as India, China and Indonesia, which have large populations and various social and economic problems that accelerate the spread of tuberculosis. Low economic levels and population density in urban areas increase the risk of transmission compared to more sparsely populated and economically better off areas (Pramono, 2021).

Attitude

Attitude is a very important aspect in raising awareness that respondents suffering from pulmonary TB need to be examined by health workers. This is so that during the treatment process, respondents have a greater chance of recovery. This condition is in line with Notoatmodjo's theory which states that attitude is a reaction or process of readiness to respond to certain environmental objects as a form of appreciation of these objects (Gloria, 2019).

Knowledge

The successful treatment of pulmonary tuberculosis patients is strongly influenced by the patient's understanding of the treatment program. Knowledge about health includes individual behavior in undergoing treatment or care, diet, and daily habits in accordance with established health standards. Signs that indicate a lack of knowledge about health include refusal of treatment, low participation in health activities such as absenteeism in meetings with health workers, and neglect of advice given by health workers (Tukatman et al., 2021).

Role of Health Workers

The role of health workers is crucial in improving the quality of optimal health services for the community. This contributes significantly to the healing process of TB patients, especially in terms of their adherence to treatment (Herawati et al., 2020). Patients who are stuck in bad habits often find it difficult to follow treatment instructions consistently. Therefore, health workers are encouraged to provide support in building healthy habits to improve treatment success rates (Pitoy et al., 2022).

METHOD

This study is an observational analytic study that uses a quantitative approach with a *cross-sectional* design, where observation or measurement of variables is done only once using a questionnaire. This study was conducted at the Lawawoi Health Center, Sidenreng Rappang Regency in December 2024 - March 2025. The population in this study were all TB patients who were undergoing treatment and registered in the TB registration book from

January to November 2024 at the Lawawoi Health Center which was divided into 4 quarters, namely 67 patients. The research sample was taken with a *simple random sampling* technique, where each individual in the population has the same opportunity to be selected as a sample member. The number of samples taken was 40 people using the *Lemeshow* formula based on predetermined inclusion and exclusion criteria.

Inclusion criteria included: 1) TB patients who are willing to become respondents and (2) positive TB patients who are currently undergoing treatment. Exclusion criteria included: (1) patients who died during the treatment period, (2) patients who moved or could not be evacuated, and (3) patients who had completed the treatment period before the study was conducted.

The instrument used in this study was a 40-item closed questionnaire, which included independent variables such as income, attitude, knowledge, habits, and the role of health workers, as well as the dependent variable of patient compliance in taking TB drugs. Each question had the answer options "Yes" (score 1) and "No" (score 0), which were then summed to get a total score. The validity test results showed that all items were valid, with r-count values ranging from 0.374 to 0.812, all of which were greater than the r-table value of 0.3494 ($n = 30$, $\alpha = 0.05$). The reliability test was conducted using the Cronbach's Alpha formula and a value of 0.924 was obtained, indicating a very high level of instrument reliability.

Assessment of the total score category is carried out based on the percentage of score acquisition from the total maximum score. The high category is given for scores $\geq 75\%$, the medium category for scores 50-74%, and the low category for scores $< 50\%$. Data sources in this study were obtained from primary data and secondary data. Primary data was obtained directly from respondents through interviews using a questionnaire. While secondary data were obtained from the Report Book of the Number of Tuberculosis Patients at Lawawoi Health Center in 2024.

Data were collected through direct interviews with respondents using questionnaires (primary data), as well as recording secondary data derived from reports on the number of TB cases in the Lawawoi Health Center Registration Book in 2024. Data analysis was conducted using univariate and bivariate approaches. The univariate approach was used to describe the frequency distribution of each variable, while the bivariate approach applied the chi-square test, with a significance limit of p-value < 0.05 to indicate a significant relationship between the independent and dependent variables. If the p-value > 0.05 , it can be concluded that there is no significant relationship between the variables tested.

RESULTS AND DISCUSSION

The results of the study are presented in the form of a frequency distribution table of each variable measured in detail as shown in Table 1. Based on Table 1, it can be seen that the majority of respondents are in the age group above 40 years as much as 60%. Most of the respondents were female as much as 65%. In terms of occupation, the most common profession is housewife as much as 42.5%. Meanwhile, in terms of the latest education level, the majority of respondents are elementary school graduates as many as 37.5%. Of the total 40 respondents, 35 people (87.5%) showed compliance in taking TB drugs. A total of 23 people (57.5%) had sufficient income, 38 people (95%) had a good attitude, and 22 people (55%) had a high level of knowledge. A total of 33 people (82.5%) had good habits, and 39 people (97.5%) stated that they received support from health workers.

Based on Table 2, the results of the chi-square test obtained a p-value = 0.462 for the income variable, p-value = 0.065 for the attitude variable, p-value = 0.083 for the knowledge

variable, $p\text{-value} = 0.347$ for the habit variable, and $p\text{-value} = 0.577$ for the health worker role variable. In the bivariate statistical test using the Chi-Square test, all independent variables showed a $p\text{-value}$ above 0.05, which means that there is no significant relationship between income, attitude, knowledge, habits, and the role of health workers on adherence to taking medication in TB patients. However, two variables showed results close to the limit of significance, namely attitude ($p\text{-value} = 0.065$) and knowledge ($p\text{-value} = 0.083$).

Table 1 Characteristics, medication adherence, income, attitude, knowledge, habits, role of health workers

Characteristics	Categories	Frequency	Percentage (%)
Age	< 20 years old	1	2.50
	20 - 29 years	8	20
	30 - 39 years	7	17.50
	> 40 years	24	60
Gender	Male	14	35.0
	Female	26	65.0
Occupation	Civil Servant	0	0
	Self-employed	9	22.5
	Laborer/farmer	5	12.50
	Housewife	17	42.5
	Student	0	0
	Not working	9	22.5
Last Education	Diploma/Bachelor's degree	1	3
	SMA/SMK/MA/equivalent	10	25
	SMP/MTs/equivalent	9	22.50
	ELEMENTARY SCHOOL	15	37.5
	Not in school	5	12.5
Medication Adherence	Compliant	18	45
	Non-compliant	22	55
Revenue	Enough	23	57.5
	Low	17	42.5
Attitude	Good	38	95
	Not good	2	5
Knowledge	High	17	42.5
	Low	23	57.5
Habit	Good	11	27.5
	Less good	29	72.5
Role of Health Workers	Supportive	37	92.5
	Not Supportive	3	7.5

Although the value has not reached the limit of statistical significance ($p\text{-value} < 0.05$), this result is still noteworthy because it has the potential to show a stronger relationship if the sample size is increased or the intervention is more focused. All $p\text{-values}$ were above the significance limit of 0.05, meaning that there was no significant influence between the five variables on medication adherence in TB patients at Lawawoi Health Center in Sidenreng Rappang District. Thus, it can be concluded that in this study, income, attitude, knowledge, habits, and the role of health workers did not affect the adherence of TB patients to taking medication.

Relationship between Income and Adherence to Taking Medication

The results showed that there was no effect of income with adherence to taking medication in TB patients at Lawawoi Health Center, Sidenreng Rappang Regency where

TB patients who had low income and were not compliant in taking TB medication were 10 people (58.8%) while TB patients who had sufficient income and were compliant in taking TB medication were 11 people (47.8%). Where the results of the *chi-square* statistical test obtained a *p-value* of= 0.462 ($p>0.05$). In other words, patients who have low or sufficient income show relatively the same level of adherence to treatment.

Table 2. Bivariate Analysis Results

Variable	Categories	Adherence to Taking Medicine				Total		<i>p-value</i>
		Non-compliant		Compliant		N		
		n	%	n	%			
Income	Low	10	58.8	7	41.2	17	100	0.462
	Enough	12	52.2	11	47.8	23	100	
Attitude	Not good	2	25	6	75	8	100	0.065
	Good	20	62.5	12	37.5	32	100	
Knowledge	Low	10	43.5	13	56.5	23	100	0.083
	High	12	70.6	5	29.4	17	100	
Habit	Not good	17	58.6	12	4.1	29	100	0.347
	Good	5	45.5	6	54.5	11	100	
Role of health workers	Not supportive	2	66.7	1	33.3	3	100	0.577
	Support	20	54.1	17	45.9	37	100	

The results of this study are in line with the research of Dizky Ramadani, et al(2021) with the results of the chi-square test obtained a value of $p=0.19$ (>0.05) which also showed no significant relationship between income and compliance in taking drugs in TB patients at the Bandung City Health Center, with a value of $p=0.19$ (>0.05). The assumption of this similarity is that TB treatment programs provided free of charge by the government have reduced economic barriers as a major determinant of treatment adherence (Papeo et al., 2021).

However, this result contradicts the theory proposed by Gatchel in Dizky Ramadani, et al (2021) which states that income level affects treatment adherence. This discrepancy may be due to the context of implementing TB treatment programs in Indonesia which are more inclusive and do not financially burden patients, in contrast to the context or population in Gatchel's theory which may apply in countries with different health systems.

In this study, the data showed that there was very little difference in adherence rates between income groups, with 47.8% for the moderate-income group and 41.2% for the low-income group. In fact, among the moderate-income group, more than half (52.2%) did not adhere to medication rules. This finding suggests that income is not the main factor influencing adherence, but it is possible that other factors such as knowledge, individual awareness, drug side effects, support from family, or involvement of health workers have a more significant influence.

In this study, it was found that there was no relationship between income and medication adherence in TB patients. This is due to the fact that TB treatment is part of a national disease control program, and therefore is free of charge. In addition, access to health services is also not an issue, as pulmonary TB treatment can be carried out at community health centers. Thus, both low-income and high-income patients have the same opportunity to receive adequate treatment.

Relationship between attitude and medication adherence

The results showed that there was no effect of attitude with adherence to taking medication in TB patients at Lawawoi Health Center, Sidenreng Rappang Regency where TB patients who had a poor attitude and were not compliant in taking TB medication were 2 (25%), while TB patients who had a good attitude and were compliant in taking TB medication were 12 people (37.5%). Where the results of the *chi-square* statistical test obtained a p-value of 0.065.

This finding is in line with research conducted by Qhumairah et al (2024) showed the results of the analysis using the *Chi-square* statistical test obtained a p value of 0.593, which is greater than 0.25. Thus, it can be concluded that there is no relationship between attitudes and treatment compliance of Lung TB patients at RSUD dr. La Palaloi Maros Regency (Qhumairah et al., 2024).

Theoretically, attitudes can be interpreted as feelings that support or reject certain behaviors. However, this study shows that positive attitudes are not always directly proportional to compliance behavior. Of the 8 respondents who had unfavorable attitudes, 75% of them remained compliant in taking medication. In contrast, of the 32 respondents who showed a good attitude, only 37.5% were compliant.

The influence of individual attitudes on compliance in drug use is very significant. Motivation to maintain health plays an important role in influencing various factors that are directly related to patient behavior in managing their disease. It can be concluded that attitude reflects the order between interacting components in understanding the surrounding objects. A positive attitude towards negative things will have an impact on the behavior of tuberculosis patients in undergoing treatment (Ahdiyah et al., 2022).

The results of this study show that respondents tend to have a positive attitude towards treatment, although they still face some obstacles. This favorable attitude is reflected in their belief and trust in the importance of TB treatment. This positive attitude is influenced by the level of education and knowledge possessed, which contributes to an understanding of the benefits of adherence to therapy. With a positive attitude, patients can accept, believe, appreciate, and take responsibility for the treatment process, thereby increasing their chances of recovery and preventing drug resistance.

Relationship between Knowledge and Adherence to Taking Medication

The results showed that there was no effect of knowledge with adherence to taking medication in TB patients at the Lawawoi Health Center, Sidenreng Rappang Regency where TB patients who had low knowledge and were not compliant in taking TB medication were 10 people (43.5%), while TB patients who had high knowledge and were compliant in taking TB medication were 5 people (29.4%). Where the results of the *chi-square* statistical test obtained a p-value of 0.083.

This study is in line with the research of Gabriella (2023) showing the value of p-value=0.533 which means that there is no relationship between knowledge and compliance with taking medication for Tuberculosis (TB) patients at the Kupa-Kupa Health Center. The better the knowledge of TB patients, the better the patient's compliance (Maga and Hohedu., 2023).

In this study, it was found that most TB patients with low knowledge actually showed a higher level of adherence (56.5%) compared to patients with high knowledge (29.4%). This finding contradicts the general assumption that the higher one's knowledge, the higher the level of adherence. The explanation for this is that patient adherence to treatment is not only influenced by cognitive aspects such as knowledge, but also by

various external factors such as family support, economic conditions, drug side effects, access to health services, trust in medical personnel, and social stigma.

Although a person has good knowledge, it is not necessarily reflected in adherence behavior to long-term treatment such as TB. This is consistent with health behavior theory, where knowledge and attitudes are only some of the factors that influence a person's actions, along with social norms, behavioral control, intentions, and a supportive environment. Therefore, interventions to improve adherence should not only focus on improving knowledge, but also consider a holistic systemic approach.

Based on the results of the study, the majority of TB patients have a good understanding of the treatment of the disease. This includes knowledge of how to take medication, what to do and what to avoid during the treatment process, and the possible side effects of medication. With good knowledge, individuals can improve and maintain their health.

Relationship between habits and medication adherence

The results showed that there was no effect of habits with adherence to taking medication in TB patients at Lawawoi Health Center, Sidenreng Rappang Regency where TB patients who had poor habits and were not compliant in taking TB medication were 17 people (58.6%), while TB patients who had good habits and were compliant in taking TB medication were 6 people (54.5%). The results of chi-square analysis showed a value of $p = 0.347$ ($p > 0.05$), indicating that patients' daily habits in undergoing health activities are not directly related to their level of compliance in taking medication. From the data collected, there were 17 TB patients with poor habits and non-adherence (58.6%), while 6 TB patients with good habits and adherence (54.5%). This difference in proportions is so small that it does not indicate a statistically significant relationship.

The results of this study are in line with the research of Megasari(2023) from the results of the research conducted, it was found that there was no relationship between a significant correlation between compliance with taking medication and the quality of life / habits of patients at the Sananwetan City Health Center with a value of $p\text{-value} = 0.476$. Where patients who are obedient in taking medication will get a good quality of life as well. Although patients lead a healthy and regular lifestyle, this does not automatically guarantee adherence to medication, because adherence is influenced by more complicated psychosocial variables such as awareness, individual motivation, and external support (Megasari et al., 2023).

Based on the results of the study, the better one's habits are, the more respondents will follow the prescribed treatment. Researchers argue that habits do not affect adherence in TB treatment because habits only show readiness or desire to act and are not yet at the stage of performing health behaviors, in this case following TB treatment. Respondents have good habits in responding to TB treatment, but in reality they cannot perform according to their habits. This could be influenced by various other factors that affect respondents' adherence. While healthy habits such as keeping the house ventilated, wearing a mask, and eating nutritious food are important in the healing process, this study shows that good habits are not always directly related to medication adherence.

However, in this study there are errors and shortcomings related to the researcher's understanding of the habits of TB patients, where from several previous studies after further examination it was found that the habit patterns of TB patients refer to the behavior patterns of TB patients. Therefore, researchers argue that habit patterns are similar to the behavior patterns of TB patients.

Relationship between the role of health workers and adherence to taking medication

The results showed that there was no effect of the role of health workers with adherence to taking medication in TB patients at Lawawoi Health Center, Sidenreng Rappang Regency where TB patients who did not get good support from health workers and were not compliant in taking TB medication were 2 people (66.7%), while TB patients who received good support from health workers and were compliant in taking TB medication were 17 people (45.9%). Where the results of the Chi-square statistical test obtained a p-value of 0.577 ($p > 0.05$).

This study is in line with research Dadang(2023) from the results of research conducted obtained no relationship between the role of health workers with treatment compliance with p-value=0.189. The successful treatment of TB patients is strongly influenced by the role of health workers. One of their responsibilities is to provide information about TB disease and motivate patients to be patient during the long treatment process. In addition, health workers are also tasked with reminding patients about taking drugs and examinations related to TB disease (Dadang et al., 2023).

The role of health workers is very important in improving the quality of optimal health services to the community, so that it greatly supports the improvement of the healing process for people with TB, especially in terms of adherence to taking TB drugs. A positive attitude towards health workers affects patient compliance. Patients get motivational encouragement from health workers to always be on time in taking drugs at the health center and continue to pay attention to health conditions, so that patients feel cared for by officers and follow all the advice given during the treatment process (Habriani et al., 2023).

In addition, motivation from health workers is also an important factor influencing patient compliance behavior. Support from health workers is valuable when patients adapt to new healthy behaviors, which are considered important. They can also influence patient behavior by showing enthusiasm for certain actions and consistently giving positive rewards to patients who successfully adapt to their treatment program (Susanti Anskar et al., 2021).

Based on the results of the study, it was found that of the 3 respondents who felt that they did not get support from health workers, there were 33.3% who were still compliant in taking medication, while of the 37 respondents who felt supported, only 45.9% were compliant. This means that although the majority of patients felt that health workers played a supportive role, more than half of them remained non-adherent in taking medication, thus indicating that the perceived supportive role of health workers is not necessarily directly proportional to patient compliance. Health workers always listen to any complaints submitted by patients. Health workers are always present at the health center when patients take medicine and do not forget to provide explanations about how to take medicine and the schedule for taking medicine at the health center. Patients always get good support, so that it can encourage patients to continue undergoing treatment until they are declared cured by always being obedient in taking TB drugs according to the predetermined dose.

CONCLUSION

Based on research conducted on 40 tuberculosis patients at the Lawawoi Health Center, Sidenreng Rappang Regency, it was found that the majority of respondents were not fully compliant in taking TB drugs. Bivariate analysis with the Chi-square test showed that there was no significant relationship between income ($p = 0.462$), attitude ($p = 0.065$), knowledge ($p = 0.083$), habits ($p = 0.347$), and the role of health workers ($p = 0.577$) with adherence to taking medication ($p > 0.05$).

Nonetheless, the p values of attitude and knowledge variables that are close to the significance limit indicate that they could potentially have an influence on adherence, although it has not been statistically proven in this study. Therefore, it is recommended that educational programs and communication approaches to patients be improved, especially to strengthen their understanding, motivation, and positive attitude towards TB treatment. These efforts can be part of a preventive strategy to improve treatment success, especially in areas with a high TB burden.

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