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Determinants of Compliance with Pulmonary Tuberculosis Medication

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ABSTRACT

Background: Tuberculosis is an infectious disease caused by the *Mycobacterium tuberculosis bacillus.* Basic Health Research data in 2018 showed that the prevalence rate of TB in Indonesia was 4%. Data from Gamping II Health Center with a total of 37 drug-sensitive and drug-resistant cases and a 90% drug compliance rate, there was only 1 DR-TB patient who was not compliant with taking medication. This aims to know the Determinants of Adherence to Taking Pulmonary TB Medication. **Methods:** This study was conducted in the working area of Gamping II Health Center. This study is an observational analytic study with a cross-sectional approach. Samples were taken by a total sampling method of as many as 37 people. The measuring instrument used a questionnaire. Data were processed and analyzed using the Chi-square test with a significance level of $\rho<0.05$. **Results:** This study shows that of the 37 respondents with pulmonary tuberculosis, 22 (59.5%) respondents were compliant with taking medication and 15 (40.5%) respondents were not compliant with taking medication. Analysis using the chi-square test showed that there was a relationship between knowledge ($\rho=0.009$), family support ($\rho=0.022$), and health worker support ($\rho=0.025$), towards compliance with taking medication. While not related to patient motivation and access to health services. **Conclusion:** Of the three most dominant variables affecting adherence to taking medication is the support of health workers. From knowledge, family support and health worker support have a probability of 32.4% for adherence to taking medication in patients with pulmonary tuberculosis.

Introduction

Tuberculosis (TB) is an infectious disease caused by the *Mycobacterium tuberculosis bacillus*. The disease can affect both intra-pulmonary and extra-pulmonary. The disease is spread through the air and droplets such as coughing, sneezing, and direct contact with the sputum of patients with pulmonary tuberculosis [1]. Tuberculosis is an infectious disease that remains a global health problem. In 2020, it is estimated that around 10 million people will develop TB worldwide, 5.6 million men, 3.3 million women, and 1.1 children. Drug-resistant tuberculosis continues to be a global health threat. Estimates by the WHO show that there are 465,000 cases of people with tuberculosis in the world. Indonesia ranks 5th in terms of TB-RO cases with 24,000 cases [2]. Isoniazid (INH) and Rifampicin (RIF) resistance is the most common occurrence; resistance to both drugs constitutes Multidrug-Resistant TB (MDR-TB).

According to WHO 2021 Globally, the largest estimate of the proportion of people diagnosed with TB for the first time who have MDR/RR-TB remains around 3-4% and the best estimate for those previously treated is between 18-21% [3]. In Indonesia, MDR-TB treatment programs have

been implemented since 2009 and a program is currently being planned to treat INH monoresistant TB, one of the most potent drugs for TB treatment other than RIF, but is still limited to re-treatment cases. Globally in 2018, there were approximately half a million new cases of RR-TB, 78% of which were MDR-TB. In addition, an estimated 830,000 people suffer from TB disease caused by MTB with resistance to INH and susceptibility to RIF, referred to as INH-resistant TB (Hr-TB). It is important to know the proportion of Hr-TB in new cases, where the Xpert MTB/RIF test results show undetectable RIF resistance.

Tuberculosis programs should not only focus on re-treating cases. According to WHO 2021, TB cases in Indonesia reached 209 thousand cases. Indonesia is in third place after India and China with the most TB cases in the world. The Indonesian Ministry of Health also published the Basic Health Research which states that the prevalence of TB in Indonesia is at 4%, placing the provinces of Banten and Papua at the top of the list with a prevalence of 8.0%, followed by West Java with 5%, then followed by the provinces of Aceh, South Sumatra, DKI Jakarta, North Kalimantan, and West Papua. The provinces with the lowest prevalence in Indonesia are Bali and Bangka Belitung provinces with 1%, followed by Riau and DIY provinces with a prevalence of 2% [4]. According to the Yogyakarta Provincial Health Profile 2021, the highest prevalence of Pulmonary Tuberculosis in Sleman Regency is 749 cases and the lowest in Kulonprogo Regency is 166 cases. The treatment success of Pulmonary TB in Sleman Regency ranks the lowest at 86.4% [5].

An effort to overcome TB disease is the DOTS strategy. One of the components of DOTS is a short-term anti-tuberculosis drug (OAT) guided treatment with direct supervision by a PMO (Drug Swallowing Supervisor) [6]. PMOs are tasked with supervising TB patients to swallow drugs regularly until treatment is complete [7]. According to Abrori & Ahmad 2018 pulmonary TB treatment is carried out by taking OAT regularly at the correct dose and time for 6 months or more.

Patients who do not regularly take OAT can cause TB germs to become resistant to OAT. Thus, people with TB are resistant to OAT. According to research, this can cause the patient's condition to worsen and have to change drugs and repeat the treatment. Ulfah's research titled Factors Associated with Treatment Compliance in Patients with Pulmonary Tuberculosis includes family support, gender, education, occupation, knowledge, drug side effects, PMO role, distance to health facilities, and officer attitudes.

Materials and Method

The study was conducted in the working area of the Gamping II Health Center. This study is an observational analytic study with a cross-sectional approach and was conducted in May-June 2023. The population in this study were all patients with Pulmonary TB who examined themselves at the Gamping II Health Center in 2021-2022 as many as 37 people. The sample in this study were patients with Pulmonary TB in the Gamping II Health Center Working Area. The technique of determining the number of samples using total sampling, namely 37 people. The measuring instrument used a questionnaire to respondents containing questions based on the variables studied, such as knowledge, patient motivation, access to health services, family support, and health worker support. Data were processed and analyzed univariately, bivariately, and multivariately using SPSS 25 software. This study has passed the ethics of the Research Ethics Committee (KEPK) of the Wira Husada College of Health Sciences (STIKES) Yogyakarta with Number 301/KEPK/STIKES-WHY/III/2023.

Results and Discussion

Results

Based on Table 1, it can be seen that the most of respondents are women (59.5%), range 18 to 24 years (29.7%), last education is senior high school/equivalent (40.5%), and no work (24.3%). Based on Figure 1 shows that most of the respondents obeyed taking medicine 22 people (59.5%). The most knowledge in the good category was 24 people (64.9%). Most patients' motivation was categorized as poor motivation 19 people (51.4%). Access to health services was mostly categorized as unfavorable to 25 people (67.6%). Family support was mostly categorized as good 23 people (62.2%). Health worker support was mostly categorized as good 29 people (78.4%).

Table 1. Characteristics of Respondent

Variables (N=37)	N (%)
Sex	
Male	22 (59.5)
Female	15 (40.5)
Age (years)	
18-24	11 (29.7)
25-34	7 (18.9)
35-44	5 (13.5)
45-54	5 (13.5)
55-64	4 (10.8)
65-70	5 (13.5)
Education	
No School	2 (5.4)
Elementary School	6 (16.2)
Junior High School	6 (16.2)
Senior High School	15 (40.5)
Academic	8 (21.7)
Work	
Private employees	6 (16.2)
Trader	6 (16.2)
Housewife	4 (10.8)
Farmer/Laborer	6 (16.2)
No Work	9 (24.3)
Student	6 (16.2)

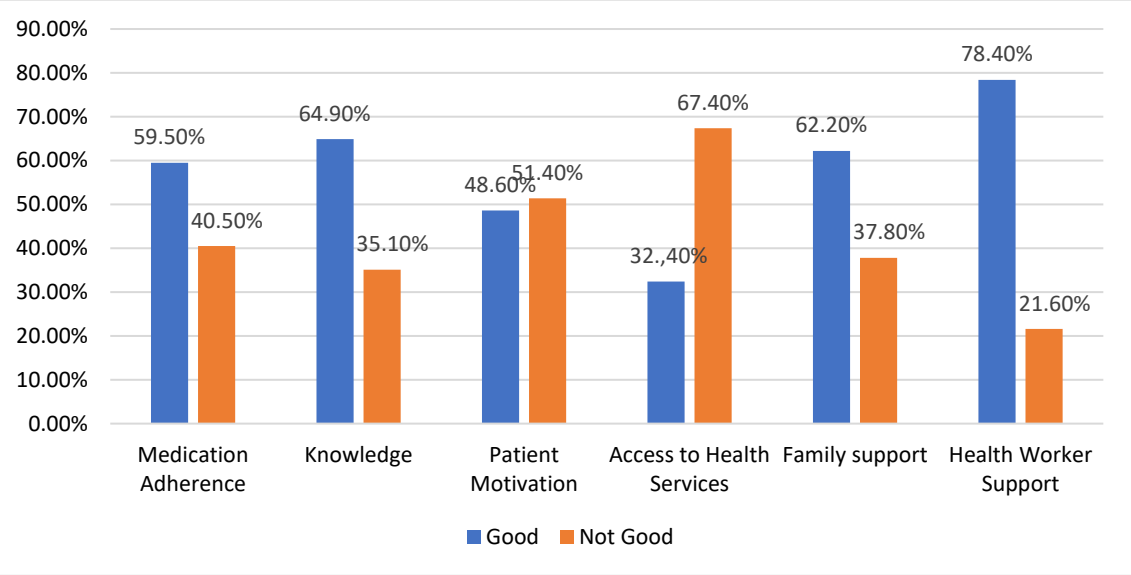

Figure 1. Frequency Distribution Based on Adherence to Taking Medication, Knowledge, Patient Motivation, Access to Health Services, Family Support, and Health Worker Support in the Gamping II Health Center Work Area in 2023

Based on Table 2 using the Chi-square test, the following results were obtained: The results of statistical tests using Chi-square show that there is a relationship between knowledge (p=0.009; 95% CI=1.511-30.159; PR=0.4), family support (p=0.022; 95% CI=1.213-21.434; PR=0.47), health worker support (p=0.025; 95% CI=1.121-39.660; PR=0.36) with adherence to taking medication in patients with pulmonary TB at the Gamping II Health Center.

Table 3 explains the logistic regression analysis with a model value of 0.017 (≤0.05) so that the independent variables together are proven to affect the model. So knowledge, family support, and health worker support affect adherence to taking medication in patients with pulmonary TB. The sig value in the Hosmer and Lemeshow test is 0.537 (>0.05), so the model created is proven to be suitable. The model equation is Y = -5.411 + 1.130 (knowledge) + 1.039 (family support) + 1.279 (health worker support).

Table 2. Bivariate Analysis Results

Variable	Medication Adherence						CI 95%	PR	P *Value*
	Compliant		Non-compliant		Total				
	n	%	n	%	n	(%)			
Knowledge									
Not good	4	10.8	9	24.3	13	35.1	1.511-30.159	0.4	0.009
Good	18	48.6	6	16.2	24	64.9			
Patient Motivation									
Not good	11	29.7	8	21.6	19	51.4	0.307-4.254	0.93	0.842
Good	11	29.7	7	18.9	18	48.6			
Access to Health Care									
Not good	15	40.5	10	27	25	67.5	0.230-3.781	1.03	0.923
Good	7	18.9	5	13.5	12	32.4			
Family support									
Not good	5	13.5	9	24.3	14	37.8	1.213-21.434	0.47	0.022
Good	17	45.9	6	16.2	23	62.2			
Health worker support									
Not good	2	5.4	6	16.2	8	21.6	1.121-39.660	0.36	0.025
Good	20	54.1	9	24.3	29	78.4			

Table 3. Multivariate Analysis of Adherence

Variable	B	OR	95%CI	P	Model	Sig	R square
Constanta	-5.411						
Knowledge	1.130	3.094	0.548-17.471	0.201	0.017	0.537	0.324
Family support	1.039	2.825	0.545-14.650	0.216			
Health worker support	1.279	3.592	0.478-26.986	0.214			

Discussion

Knowledge or cognition is very important for the formation of an action. This knowledge can help individuals to adapt to their disease, prevent complications, and comply with the therapy program so it is hoped that the higher the level of knowledge that patients have about TB disease, the higher the level of patient compliance in taking Pulmonary TB drugs. The results of this study indicate that there is a relationship between knowledge and adherence to taking medication in Pulmonary TB patients in the working area of Gamping II Health Center with a p-value of 0.009 (≤0.05).

The results of interviews in the field showed that 35 people (94.6%) of Pulmonary TB patients covered their mouths when coughing or sneezing. However, there are still 12 people (32.4%) with Lung TB patients who do not know that to prevent TB transmission by covering the mouth when coughing and sneezing, not spitting anywhere, increasing endurance by eating nutritious food and 17 people (45.9%) Lung TB patients have never heard of drug-resistant TB (MDR-TB) with its effects. The lack of patient knowledge related to Lung TB disease is related to the lack of massive frequency of promotion and counseling from health workers, Lung TB posters in health centers that are not strategically placed so that they cannot be read by patients, and the lack of role of Lung TB cadres in providing information related to Lung TB disease and its treatment.

The results of this study are in line with research stating that there is a relationship between the knowledge of patients with pulmonary tuberculosis and treatment in students in Shandong, China (p-value=0.019) [11]. Another study stated that there was a relationship between knowledge about TB and adherence to taking medication in Dalian, Northeast China (p-value=0.001) [12]. Another study stated that there was a relationship between the level of knowledge and adherence to taking medication in TB patients in Banyumas Regency, Indonesia (p-value=0.001) [13]. Another study stated that there was a relationship between knowledge and treatment compliance in tuberculosis patients at the Umbulharjo 1 Health Center in Yogyakarta (p-value=0.001) [14]. Another study stated

that there was a relationship between knowledge and treatment success in TB patients (p-value=0.000) [15]. In contrast, a study stated that there was no relationship between knowledge and adherence to taking anti-tuberculosis drugs in Indonesia (p-value=0.212) [16].

According to Setiawti 2008 motivation means a driving force that will become active if accompanied by needs to be met and is a change in energy within a person in the form of action in achieving goals. The results of this study indicate that there is no relationship between patient motivation and adherence to taking medication in patients with pulmonary TB in the Gamping II Health Center work area with a p-value of 0.842 (≥0.05).

The results of interviews in the field showed that 37 people (100%) of Lung TB patients answered taking regular medication because they had the desire to recover and 37 people (100%) of Lung TB patients took medicine according to schedule and taking medicine regularly was an obligation in order to recover. However, there were still 8 people (21.6%) Lung TB patients who answered that TB disease did not have to be eliminated from their body in order to recover and 6 people (16.2%) Lung TB patients answered that after being explained the length of treatment patients were not sure that I was able to take treatment for 6 months.

Respondents with strong motivation will certainly be compliant in taking anti-tuberculosis drugs. Patients will also have a strong drive to recover from their disease so that they will adhere to the TB treatment program that is being carried out to completion and not interrupted. A long course of treatment can risk non-compliance of TB patients in carrying out OAT treatment therapy to completion. According to research, such non-compliance may result in the risk of the TB bacillus becoming drug-resistant. Given these findings, it is important for nurses and other health workers to improve the DOTS program to break the chain of transmission of tuberculosis disease. The awareness of pulmonary tuberculosis sufferers to always control regularly is inseparable from the officers who always remind, motivate, and home visit [17]. The role of health workers who often visit home gives its own meaning to people with pulmonary tuberculosis because they feel respected and supported in carrying out the treatment process which needs to take a very long time [18].

The results of this study are in line with research stating that there is no relationship between patient motivation and treatment compliance for tuberculosis patients in Yogyakarta (p-value=0.375) [19]. In contrast, a study stated that there was a relationship between motivation and successful treatment of pulmonary tuberculosis (TB) (p-value=0.012) [20]. Another study stated that there was a relationship between motivation and treatment compliance in patients with tuberculosis (p-value=0.009) [21]. Another study stated that there was a relationship between motivation and drug compliance in pulmonary tuberculosis patients (p-value=0.004) [22]. Another study stated that there was a relationship between motivation and the recovery of pulmonary tuberculosis patients in the Sei Agul Health Center area, West Medan District, Medan City (p-value=0.000) [23].

According to research access to health services is health services that can be achieved by the community, not hindered by geographical, social, economic, and language conditions. One of them is a situation or geography that can be measured by distance, travel time, and type of transportation that can prevent someone from getting health services.

The results of this study show that there is no relationship between access to health services and compliance with taking medication in pulmonary TB patients in the Gamping II Community Health Center working area with a p-value of 0.923 (≥0.05). The results of this study are in line with research which states that there is no relationship between distance to health services and MDR/RR-TB treatment in Taizhou, Zhejiang Province, China [24]. In contrast, a study stated that there was a relationship between distance to health services and TB treatment compliance in Kaur District, Bengkulu, Indonesia (p-value=0.037) [25]. Another study stated that there was a relationship between distance to health services and treatment of pulmonary tuberculosis patients at selected health facilities in Embu County, Kenya (p-value=0.001) [26}. Another study stated that there was a relationship between distance to health services and the occurrence of drug-resistant tuberculosis in Indonesia Palembang City in 2021 (p-value=0.0001) [27]. Another study stated that there was a relationship between distance and compliance with taking OAT in patients with pulmonary tuberculosis at Cut Meutia Hospital, North Aceh Regency (p-value=0.001) [28]. Another study stated

that there was a relationship between health service distance and the treatment of tuberculosis patients in Uttar Pradesh (p-value=0.001) [29].

The results of field interviews found that 37 people (100%) of Lung TB patients answered that they felt comfortable with the waiting room facilities at the health center. However, there were still 14 people (37.8%) of Lung TB patients who answered that the distance was >2 km from their residence to the health facility (*Puskesmas*). This is because some patients are elderly so it is a little difficult if they have to routinely take medicine, so the role of health workers to routinely deliver medicine to patients is needed.

Family support is one of the factors that can influence TB treatment adherence, where the family functions as a support system for sick family members. In addition, the family is also always ready to assist if needed. According to Irnawati, 2016 support from the family makes the patient not feel burdened by the disease.

The results of this study indicate that there is a relationship between family support and adherence to taking medication in patients with pulmonary tuberculosis in the working area of Gamping II Health Center with a p-value of 0.022 (≤0.05). This study is in line with research which states that there is a relationship between family support and adherence to taking medication in Dalian, Northeast China (p<0.05) [30]. Another study stated that there was a relationship between family support and consuming anti-tuberculosis treatment at the Polonia Medan Health Center (p=0.008) [31]. Another study states that there is a relationship between family support such as information support on treatment compliance in pulmonary TB patients (P-value=0.009) [32]. Other research states that there is a relationship between the role of family support and treatment adherence of pulmonary tuberculosis patients (P-value = 0.042) [33]. Another study stated that there was a relationship between family support and treatment adherence (p-value=0.006) [34]. Another study stated that there was a relationship between family support and TB treatment adherence (p<0.05) [35]. In contrast to research that states there is no relationship between family support and treatment compliance in Tuberculosis (TB) patients (p-value=0.507) [36].

The results of interviews in the field showed that 33 people (89.2%) of Lung TB patients answered that their families always reminded patients not to take medicine late. However, there were still 12 people (32.4%) of Lung TB patients who answered that the family did not accompany patients every time they controlled and took medicine. Of the 4 patients who answered that no one reminded them not to be late taking medicine because they were elderly, patients lived in dormitories as students away from parents and family, there were also patients themselves as PMOs so that sometimes they forgot to take medicine. For this reason, the role of family and the presence of PMO if there is no family as PMO, then the closest neighbor to remind you to take medicine is very important in the treatment of patients until completion.

Health workers can monitor the occurrence of side effects by teaching patients to recognize common complaints and symptoms of side effects and encouraging them to report their condition to health workers immediately. In addition to this, health workers should always check and actively ask patients about their complaints when they come to the health facility to collect their medication. A health worker should motivate patients with pulmonary tuberculosis to seek regular treatment [6].

The results of this study indicate that there is a relationship between the support of health workers with adherence to taking pulmonary TB medication in the working area of Gamping II Health Center with a p-value of 0.025 (≤0.05). The results of multivariate analysis using logistic regression obtained that people with poor health worker support had a 3.592 times greater chance of not being compliant with taking medication compared to people with good health worker support.

The results of this study are in line with research that states there is a relationship between health worker support and non-adherence to treatment of tuberculosis patients in tropical Indonesia with a value (p-value=0.022) [37]. Another study stated that there was a relationship between health workers and non-adherence to Anti-TB Treatment in Patients in Lahore, Pakistan (p-value=0.026) [38]. Another study stated that there is a relationship between health worker behavior and patient treatment compliance with anti-tuberculosis drugs after the Covid-19 pandemic in Masaka City Health Facility, Uganda (p-value=0.001) [39]. Another study stated that there was an association between the type of DOT used (community-based DOTS) and TB treatment success in the northern

region of Namibia (p-value=0.006) [40]. Another study stated that there was a relationship between the support of drug supervisors and adherence to taking medication in pediatric pulmonary tuberculosis patients in Mesuji district, Lampung, Indonesia (p-value=0.021) [41]. In contrast, a study stated that there was no relationship between the support of health workers and treatment compliance of pulmonary TB patients in China (p-value=0.531) [42].

The results of interviews in the field showed that 35 people (94.6%) of Lung TB patients answered that health workers explained how and when to take medicine and 35 people (94.6%) health workers were friendly in providing health services. However, there were still 16 people (43.2%) of Lung TB patients who answered that health workers had never distributed brochures containing information about tuberculosis while patients were undergoing treatment. There are still patients who do not understand Pulmonary TB disease and its prevention so they consider it as a common disease that can be cured without taking routine drugs, and not an infectious disease. The importance of education from health workers in providing clear information related to pulmonary TB disease.

The results of the multivariate test of health worker support are the variables that have the most influence on adherence to taking pulmonary TB medication in the Gamping II Health Center work area. Respondents with poor health worker support were 3.592 times more likely to be non-compliant with taking medication than those with good health worker support.

The successful treatment of patients with pulmonary TB, supported by the role of health workers is very important, one of which provides information about pulmonary TB disease, motivating patients with pulmonary TB to be patient in undergoing the treatment process for a long period of time. Health workers also play a role in reminding patients to take medicine and check for pulmonary TB disease.

The results of this study are in line with the research that compliance with taking medication is related to information about the stages of taking Pulmonary TB medication, health workers also play a role in reminding patients to take medication and checking for pulmonary TB disease at the time of drug collection, health workers explain the stages of taking pulmonary TB medication and health workers also remind taking the next drug. In addition, the active role of TB officers is very influential in TB treatment, this can be seen from the lack of home visits or the lack of frequent officers calling or texting to remind patients to swallow OAT, check the progress of patient treatment and remind taking medication again, making a significant number associated with treatment compliance. In contrast to a research, it states that there is no significant relationship between the role of health workers and the compliance of taking drugs for patients with Pulmonary TB undergoing treatment in the working area of the Rao Puskesmas, Pasaman Regency, p=0.454 (>0.05).

According to the author, the factor of the attachment of health worker support to adherence to taking medication in patients may be the patient's lack of knowledge related to the disease and also the treatment process, which results in indiscipline in taking anti-TB drugs, lack of adherence is most likely caused by less open communication between patients or their families and health workers. Communication between staff and patients with pulmonary TB is an important component in achieving treatment adherence. In addition, some patients experience nausea, and vomiting when taking drugs that they must take regularly, resulting in drug resistance, even though health workers have provided education related to treatment and lend assistance if there are problems. The support of health workers will motivate respondents to undergo Pulmonary TB treatment completely. The results of this finding are in accordance with the theory put forward by the 2011 national guidelines for tuberculosis control. The role of health workers in TB treatment is a support system for patients by assisting in the form of information or advice, real assistance, or actions that have emotional benefits or affect the behavior of the recipient [6].

Conclusion

There is a relationship between knowledge, family support, and health worker support for adherence to taking medication in Pulmonary TB patients in the Gamping II Health Center work area. Increase socialization and counseling in providing information related to pulmonary TB treatment to PMO members and families as well as health workers according to procedures so that compliance

with pulmonary TB patients is high and optimal which will affect recovery and patients remain obedient in carrying out routine and complete treatment. The patient's family optimizes the role of family support as a source of social support in the form of instrumental and emotional information and self-esteem. So that it can increase the success of the TB treatment program completely.

Declaration

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Conflicts of Interest: There is no conflict of interest in this study.

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