

ANALYSIS OF FACTORS AFFECTING THE ADHERENCE OF TAKING ANTITUBERCULOSIS DRUGS AT PUSKESMAS KOTA MALANG

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ABSTRACT

Tuberculosis (TBC) is an infectious disease caused by *Mycobacterium tuberculosis*. The high mortality rate from TBC is associated with cases of resistance due to low adherence to medication. This study aimed to determine the effect of age, number of family members, and family support on adherence to antituberculosis drugs. The study was observational using a cross-sectional design. The subjects were 52 outpatients with tuberculosis who met the inclusion and exclusion criteria during the July-August 2022 period at Puskesmas Malang. The results of the study of the most age were 26-35 years as much as 26.92%. The highest number of family members was 3-4 people at 61.54%. Most family support was in the strong category at 86.54%. The results of the ordinal regression test showed that age had a p value of 0.045. The number of family members had a p value of 0.127. Family support had a p-value of 0.040. The conclusion was that age and family support affected medication adce with ($p < 0.05$). The number of family members did not affect medication adherence ($p > 0.05$). Age, number of family members, and family support simultaneously influenced medication adherence by 23.7%, while 76.3% were influenced by other factors that were not studied.

Keywords: Adherence to taking medication, Family motivation, Tuberculosis

INTRODUCTION

Tuberculosis (TBC) is an infectious disease caused by *Mycobacterium tuberculosis* (MTB). MTB typically occurs after the lungs and different parts of the body, such as the kidneys, spine, and mind. Not every person presenting with TB experiences sickness. The two TBC-related conditions were explicitly inactive TBC debridement and TB contamination. TBC infection will be dangerous on the off chance that not treated right away (CDC, 2022).). MTB spreads through the air when a person with pulmonary TBC infection coughs, talks, or sings. People nearby can inhale MTB and will subsequently be exposed. TBC are not contagious when shaking hands, sharing food or drinks, touching sheets or latrine chairs, sharing toothbrushes, and kissing. When an individual inhales MTB, these microorganisms can enter the lungs and thrive. MTB spreads through the blood to parts of the body such as the kidneys, spine, and brain. TBC in parts of the body, such as the kidneys and spine, are generally not contagious. People with TBC can transmit it to people around them. The symptoms of TBC depend on the presence of MTB. MTB located in the lungs (TBC pneumonia) can cause symptoms such as a severe cough lasting 3 weeks or more, tightness, and coughing accompanied by blood or mucus. Other symptoms of TBC disease are fatigue, weight loss, chills, fever, night sweats (CDC, 2022). The treatment of tuberculosis comprises two phases: 1) the beginning phase, in which drugs are utilized consistently to diminish the MTB. The underlying phase of treatment for new patients over a long period of time is consistent. At this stage, drugs such as Isoniazid, Rifampicin, Pyrazinamide, and Ethambutol are used. 2) In the high-level stage, drugs are utilized

consistently to kill the remains of MTB that are present in the body, particularly diligent microbes, so that patients can recuperate and forestall a repeat. The span of the high-level stage was 4 months. Treatment is given as a blend of fitting antituberculosis drugs, containing no less than 4 sorts of medications to forestall opposition ([Kementerian Kesehatan Republik Indonesia, 2020](#)).

According to the WHO (2023), the overall number of TBC patients is 10.6 million individuals, or 134 individuals for every 100.000 cases in 2021. As many as 6.7% of patients were TBC patients with HIV. Topographically, most TBC cases in 2021 were in Southeast Asia (45%), Africa (23%), and the Western Pacific (18%), with additional unassuming parts in the Eastern Mediterranean (8.1%), the Americas (2.9%) and Europe (2.2%) ([WHO, 2023b](#)). The death rate due to TBC in Indonesia was 150.000 people in 2021. According to WHO information (2023), from an all-out population of 274 million in 2021, it is estimated that the complete rate of TBC is 969,000 cases. The number of cases was 354 per every 100.000 individuals. All new and backsliding cases were 432.577, and 92% had aspiratory tuberculosis. The death rate was 16% because of the mortality gauges/episodes. In the meantime, the achievement rate of TBC treatment in patients with new and backsliding cases was 86%, which was maintained in 2020 ([WHO, 2023d](#)).

The high mortality rate from TBC is associated with bacterial resistance to anti-tuberculosis drugs. According to the WHO, (2023) there are 70,000 cases of resistance per year between 2015 and 2021. Resistance is associated with relapse owing to low adherence to medication. Relapse cases worldwide are estimated at 6,423,5200 per year ([WHO, 2023](#)). Previous research has shown that age, education, occupation, income, lack of knowledge, alcohol consumption, and smoking were not associated with the development of drug-resistant TBC (DR-TBC). Risk factors that increase DR-TBC include adherence to treatment, side effects, contact history, and distance from healthcare facilities ([Partowidigdo, 2021](#)).

Puskesmas Malang plays a role in implementing TBC control as a government program. National TBC-free program by 2030 by increasing access to quality TBC services and pro-patients. Quality prevention and treatment of TBC services by promoting health to the public through 1) dissemination of correct information about TBC to the public massively through public communication channels; 2) implementation of efforts to change community behavior in the prevention and treatment of TBC; 3) involvement of community leaders, religious leaders, and influencers social media to disseminate communication, information, and education materials about TBC; and 4) delivery of information to the public regarding TBC services according to standards ([Michelle Angelika S and Yohanes Firmansyah, Liesia Asiku, 2021](#)). This study is expected to support the government's TBC-free program by 2030.

The *dropout* rate for TBC treatment in Indonesia remains high. The National Program for TBC Control in Indonesia began implementing the Directly Observed Treatment Short-course (DOTS) strategy. Based on research data shows that adherence to taking medication is influenced by marital status, annual income, and supervision of medical personnel ([Fang et al., 2019](#)). Adherence to taking medication is also influenced by knowledge of TBC treatment, the role of officers, the role of Drug Swallowing Supervisors, side effects of antituberculosis drugs, length of taking drugs, and having confidence in being healthy ([Christy., et al., 2022](#)).). Several reasons have been identified as causes of medication adherence, including mistrust and discomfort in government health facilities, the distance of care facilities to the patient's location, fears of loss of time from work when having to obtain the medication, social stigma, failure to acknowledge the seriousness of symptoms and the need for treatment ([Sirc, 1989](#)). The most frequent reasons for failure to take medication include running out of medication because the patient travels. The predictive factors of failure to take medication using herbal remedies, alcohol abuse, and HIV coinfection. Counseling about TBC is necessary, including 1) Emphasis on the importance of completing treatment regardless of feeling better, traveling long distances, and side effects, and 2) Reassuring patients that TBC can be cured after using the correct TBC medication as

prescribed by the health worker. In addition to improving patient counseling and education, patient-friendly TBC treatment services, especially for TBC/HIV co-infection patients (Pablos-Méndez et al., 1997). Lack of social support also affects medication adherence. Better medication adherence improvement can be achieved with comprehensive health education for patients' family members and the wider community and the strengthening of social support structures need to be addressed (Gebreweld et al., 2018).

Previous studies have looked at the relationship of family motivation to medication adherence but did not observe the effect of family motivation on medication adherence. This study aimed to determine the effect of family motivation on adherence to taking antituberculosis drugs. This study hypothesizes that there is an influence of family motivation on medication adherence. This study is expected to not ignore the motivation of families to achieve successful treatment in patients with TBC. Knowledge of the risk factors that affect medication adherence should be considered when making comprehensive treatment decisions.

METHOD

This was an observational research design using a cross-sectional approach. Freeviability, namely age, number of family members, and family motivation, and dependent variables, namely adherence to taking medication. The population comprises outpatient TBC patients seeking treatment at five health centers in Malang during the period July-August 2022. The sampling method was purposive sampling and obtained as many as 52 subjects who met the following inclusion criteria: 1) Outpatient TBC patients who were willing to participate in this research, 2) outpatients with TBC who could read and write, 3) outpatients with TBC aged >17 years, 4) outpatients with TBC receiving standard 6-month treatment (2 months intensive phase and 4 months advanced phase) with isoniazid (H), rifampicin (R), pyrazinamide (Z), and ethambutol (E) (2HRZE/4HR).

Instrument

Family motivation was estimated using the Perceived Social Support from Family (PSS-Fa) scale. The survey comprises 20 inquiry things, with each question having three choices: "Yes," "No," or "Don't have the foggiest idea." The complete score was the reason for deciding on family motivation classifications, specifically strong (score ≥ 11), weak (score 7-10), and no motivation (score ≤ 6). Handling of drug adherence information using the 8-item Morisky Medication Adherence Scale (MMAS-8) poll. The poll comprises 8 inquiries with 2 response choices "yes" and "no." The all-out score was the reason for deciding on the level of adherence to taking prescriptions. Adherence to taking a prescription was sorted into 3 categories: high adherence (score 8), moderate adherence (score 6-7), and low adherence (score <6). The Pearson product-moment correlation was used to test the validity of the questionnaire. The validity test is declared valid if r counts > r tables; otherwise, if r counts < r tables, it is considered invalid. Cronbach's alpha was used to test the reliability of statements in the research. statements were considered reliable if their Cronbach's alpha score was greater than 0.6. The statement was considered unreliable if the Cronbach's alpha score was < 0.6.

Procedure

The Data collection was carried out after passing the ethical test at IIK STRADA Indonesia Kediri with certificate number: 2984/KEPK/VI/2022. Data were collected after the patient completed the questionnaire. This study was conducted after obtaining approval from the Puskesmas and Malang City Health Offices. Questionnaires were administered to the patients according to the established criteria. To ensure the quality of the research data, assistance was provided when filling out the questionnaires. The patient also completed a statement of consent as a respondent. and mentoring. MMAS-8 and PSS-Fa questionnaires that were filled out by respondents were collected, and then data processing was carried out. The processing of research data is carried out in stages, *editing*, namely, checking and

improving questionnaire filling. When there was incomplete information, the questionnaire was not used. *Coding* converts data in the form of sentences or letters into numerical data. Coding was required during data entry. Data entry is completed in the columns of the code sheet according to the answers to each question. Data are in the form of answers to each respondent in the form of a number code. The code was entered into the SPSS software. The *cleaning* was rechecked to avoid errors or incorrect data input.

The characteristics of TBC patients were classified into 5 categories: age, gender, level of education, occupation, and number of family members. Age was grouped into 5 categories, namely 17-25 years, 26-35 years, 36-45 years, 46-55 years, 56-60 years, and >60 years. Gender was grouped into 2, namely male and female, and education level was classified into five levels: elementary school, middle school, high school, bachelor's degree, and Ssarjana. Employment was classified into 2, that is, employed and unemployed. The number of family members was classified into 4 groups, 1-2 people, 3-4 people, 5-6 people, and >6 people.

Analysis

Data analysis was carried out as follows. 1) Univariate analysis aimed to explain the characteristics of each research variable. In this study, descriptive analysis was used to produce percentages. 2) Bivariate analysis was performed on 2 or more variables that were thought to have an influence. 3) Multivariate analysis, which is to determine the influence of more than 2 independent variables. Data analysis was used to determine the effect of each independent variable and dependent variable using an ordinal regression test with SPSS version 25 software to determine the effect of the independent variable on the dependent variable with a p-value = 0.05.

RESULTS AND DISCUSSION

Based on data obtained in July-August 2022, 52 respondents were obtained. The selected respondents were patients aged >17 years who met the inclusion criteria. The instruments used were patient demographic data questionnaires, family motivation using the PSS-Fa questionnaire, and medication adherence using the MMAS-8 questionnaire, which met the validity and reliability test. Of the 20 questions contained in the PSS-Fa questionnaire, 8 items of the MMAS-8 questions show that the r value of each item is calculated > r table, it is declared valid with a significance value of 0.05. The results of the reliability test show that the value of Cronbach's alpha is >0.6, indicating that the research instrument is reliable (Sujarweni, 2015). The results of the study are as follows;

Table I. Correlation Value of Each Statement Item

Variable	Item	r calculate	r table (5%) (20)
Family motivation	1	0.792	0.444
	2	0.792	
	3	0.559	
	4	0.792	
	5	0.792	
	6	0.792	
	7	0.559	
	8	0.792	
	9	0.792	
	10	0.792	
	11	0.792	
	12	0.792	
	13	0.496	
	14	0.496	
	15	0.496	

	16	0.496	
	17	0.505	
	18	0.505	
	19	0.505	
	20	0.505	
	1	0.750	
	2	0.580	
	3	0.462	
Adherence of taking medication	4	0.750	0.444
	5	0.462	
	6	0.462	
	7	0.462	
	8	0.619	

Table II. Reliability Value of Each Statement Item

Variable	Cronbach's Alpha	N of items
Family motivation	0,921	20
Adherence of taking medication	0,700	8

Age

Based on Table III shows that most patients are aged 26-35 years by 26.92%. According to the World Health Organization (WHO, 2023), the age of patients is mostly 25-34 years (WHO, 2023).. Age 26-35 years, is the productive age for work. High work activity leads to lack of rest. A weak immune system makes a person more susceptible to tuberculosis (Dewantoro et al., 2022). A study conducted by the World Health Organization (WHO) in 2018 showed that people aged 15-24 years have a 2 times higher risk of getting TB than people aged 25-64 years. The same study also showed that people aged 65 years and over have a risk of developing TB 3 times higher than people aged 25-64 years (WHO, 2023c).

Gender

According to the WHO (2023), male patients with TBC are more common than female patients. The number of male patients tended to be higher than that of female patients. The latest TBC prevalence data show that TBC is more common in males than female. This difference is not only due to biological function but also due to the impact of risk factors and exposures (lifestyle factors such as smoking, occupation, indoor air pollution related to cooking processes, and industrial exposure). There are poor families, and the fulfillment of food needs is much more urgent than the need for health, because they have limited resources. This is due to the low position of women in decision-making in the family, which limits their access and control in the management of resources for health (Sirc, 1989).

Education

As stated in Table III, the level of elementary and high school education was 32.69% higher than that of the others. Educational level is one of the factors that can affect a person's risk of TBC. The higher a person's level of education, the lower the risk of developing tuberculosis. Highly educated people are more likely to be knowledgeable about tuberculosis and its prevention. In addition, highly educated people are more likely to have access to quality healthcare. A study conducted by the WHO (2018) showed that people who do not go to school have a risk of getting TBC 2 times higher than those who attend elementary school. The same study also showed that people who attended high school had a 1.5 times higher risk of developing tuberculosis than those who attended high school. Therefore, it is important to improve people's education levels to help prevent TBC disease. This can be done by providing access to quality education to everyone, especially children and

adolescents (WHO, 2023c). Low knowledge about TB results in low efforts of a person to guard against transmission of the disease. Increasing public knowledge about TBC is a strategy to increase awareness of TBC disease (Luba *et al.*, 2019).

Employment

Based on table III shows that the majority of TB patients work, as much as 84.62%. Previous research has shown that the type of work affects the transmission of TB disease. MTBs are susceptible to the sun's ultraviolet rays so they will die within a few minutes. Family income will have an impact on daily lifestyles including food, and health maintenance. Someone who has a low income will consume foods with nutritional levels that are not for the needs of the body. Low nutritional status causes a person to be susceptible to infectious diseases including tuberculosis. Less income affects the feasibility of the house owned so that it does not meet health requirements it will facilitate the transmission of TB disease (Isnani, Soediono and Audina, 2019).

Number of family members

Based on table III shows that the majority of family members are 3-4 people. A large number of family members can increase the risk of transmission of TB disease. This is because the more people live in one house, the more likely a person is to be exposed to MTB released by TB sufferers through coughing or sneezing. In addition, people who live in cramped and poorly ventilated homes are also more at risk of contracting tuberculosis. In a study conducted by WHO, (2018) shows that people who live in homes with more than 10 family members have a 2 times higher risk of contracting TB than people living in homes with 5 or more family members. The same study also showed that people who live in cramped, poorly-ventilated homes have a 3 times higher risk of contracting tuberculosis than people who live in spacious, well-ventilated homes (WHO, 2023c).

Table III. Patient Demographics

Characteristics of the patient	Sum (N)	Percentage (%)
Age (Years)		
17-25	10	19.23
26-35	14	26.92
36-45	7	13.46
46-55	12	23.08
56-60	4	7.69
>60	5	9.62
Gender		
Male	31	59.62
Female	21	40.38
Education		
Elementary school	17	32.69
Midle school	11	21.15
High school	17	32.69
Diploma	2	3.85
Bachelor	5	9.62
Employment		
Employed	44	84.62
Unemployed	8	15.38
Number of Family Members		
1-2	7	13.46
3-4	32	61.54
5-6	9	17.31
>6	4	7.69
Total	52	100

Family motivation

Table IV shows that the highest family motivation with a strong category was 86.54%. There is a relationship between knowledge, family support, social support, and self-care behavior. Based on previous Research has shown that family knowledge and motivation are related to attitudes (Sukartini et al., 2019). Family motivation affects medication adherence in patients with TBCs (Irnawati et al., 2016), (Trilianto et al., 2020).). Family members are related to the role of drug swallowing supervisors involved by health workers at the puskesmas, and are expected to motivate patients for successful treatment. Previous research has shown that family motivation is related to adherence to anti-tuberculosis drugs (Pitters et al., 2019).). Family support that can be provided to patients can be in the form of informational support, namely, providing information about TBC disease suffered by patients, and assessment support, namely, providing encouragement and support to patients so as not to despair and quickly give up fighting the disease (Irnawati et al, 2016).). TBC disease cure is a coordinated approach that includes not only clinical services but also strong family and community motivation needed during the treatment process (Saqib, Ahmad and Panezai, 2019). Family motivation regarding emotional, informational, material, and reward aspects is needed during the patient's healing and recovery process (Nasution et al., 2020).

Adherence to taking medication

Table IV shows that adherence to taking moderate-category drugs was 59.62%. Based on previous research, it appears that the attitude of patients with tuberculosis is related to adherence to the recommendation to take anti-tuberculosis drugs (Dian Novita Hanggi, 2020). Adherence to medication is influenced by the level of knowledge about TBC disease, family motivation, and the patient's family attitude (Dewi, et al., 2021). Disobedience to taking medication is also caused by low levels of knowledge about TBC, poor relationship between patients and health workers, fear of drug side effects, suboptimal role of drug swallowing supervisors, and long use of drugs and patients feeling cured (Asriwati et al., 2021). A good doctor-patient relationship and knowledge related to TBC contribute to medication adherence (Chen et al., 2020). Low medication adherence can also be attributed to patients' low knowledge of tuberculosis, poor self-management, and traditional medicine (Zhang et al., 2020). Side effects of drugs and motivation from drug swallowing supervisors. Comorbidities, feeling healed, and patients feeling bored while taking drugs are also behind obedience (Depo and Pademme, 2022). Different studies have shown that the side effects of anti-tuberculosis drugs are related to adherence to taking drugs (Christy., et al, 2022). Low knowledge, loss of income, stigma, lack of social motivation, drug side effects, and treatment duration appear to be important barriers to adherence to treatment (Gebreweld et al., 2018). Data from different studies show that marital status, annual income, supervision of medical personnel, and knowledge of anti-tuberculosis treatment are essential for improving patient treatment adherence (Fang et al., 2019).

Table IV. Characteristics Of Family Motivation And Adherence To Taking Medication

Category	Sum (N)	Percentage (%)
Family Motivation		
Strong	45	86.54
Weak	6	11.54
No motivation	1	1.92
Total	52	100
Adherence to Taking Medication		
High Adherence	10	19.23
Moderate Adherence	31	59.62
Low Adherence	11	21.15
Total	52	100

Regression analysis

Based on Table V, age has a p-value of 0.045 or < 0.05 , indicating that there is an influence of age on adherence to taking drugs. The number of family members had a p-value of 0.127 or >0.05 , indicating that there was no influence on the number of family members on adherence to taking medicine. Family motivation had a p-value of 0.040 or < 0.05 , indicating that family motivation affects adherence to taking medication. Based on the Pearson correlation test, age was not related to adherence to medication, with a p-value of 0.112 or >0.05 . The number of family members was not related to medication adherence, with p-values of 0.140 or >0.05 . Family motivation was associated with medication adherence with a p-value of 0.49 or <0.05 , and low closeness was shown with a correlation coefficient value of 0.275. Based on the results of ordinal regression tests, age, number of families, and family motivation simultaneously influenced adherence to medication by 23.7%, while 76.3% was influenced by other factors that were not carried out. Limitations: Our study had some limitations. First, neither respondents' knowledge of TBC nor their knowledge of TBC prevention methods was evaluated. Second, our study did not examine some variables that could affect people's knowledge and attitudes about TBC, such as how far it is to get to health facilities and how long it takes to get to health services.

Table V. The Effect of Age, Number of Family Members and Family Motivation on Adherence to Taking Medication

Variable	<i>p value</i>
Age	0.045
Number of Family Members	0.127
Motivation on Adherence to Taking Medication	0.040

CONCLUSION

Based on the results of the study, it can be concluded that the majority of TBC patients in the Malang City Health Center were aged 26-35 years as much as 26.92%), most of them were male (59.62%), the majority of high school graduates (32.69%), and most of them worked as much as 84.62%. The majority of family members were 3-4 to people as much as 61.54%). The motivation rate of the majority of families was strong (86.54 %). The adherence rate to medication was mostly moderate (59.62 %). The results showed that age had an influence on adherence to medication, with a p-value of 0.045 or <0.05 . The number of family members had no effect on medication adhe with ($p = 0.127$). There was also an influence of family motivation on adherence to taking medication at the Malang health center with a p-value of 0.040 or <0.05 . The magnitude of the influence of age, number of family members, and family motivation simultaneously was 23.7%, indicating that 76.3% of medication adherence was influenced by other factors that were not studied. This study is expected to serve as a reference for stakeholders to improve the success of TBC treatment. These findings can be used as preliminary data for future studies, which involve a larger number of subjects, as well as involve several factors that were not done in this study.

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