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Relationship between Pulmonary TB Patient Behavior and Family Support with Treatment Adherence at Hospital in Indonesia

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ABSTRACT
Estimates place the number of new cases of tuberculosis (TB) at 10.4 million per year. Based on an initial survey of 10 TB patients, it was found that 6 patients were not compliant with treatment, while 4 other patients were compliant with treatment. The aim of this research was to determine the behavioral factors of pulmonary TB patients with patient treatment compliance at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. The research design used in this research is an analytical survey with a cross sectional approach. The population in this study was all 58 patients and the samples were taken by a total sampling method of 58 people. Data collection methods are primary data, secondary and tertiary data. The data analysis used is the binary logistic regression test. The results showed that age had a sig-p value of 0.646> 0.05, education sig-p 0.032< 0.05, employment sig-p 1.0> 0.05, knowledge sig-p 0.012< 0.05, attitude sig-p 0.036 < 0.05, sig-p action 0.003< 0.05 and family support sig-p 0.048< 0.05.The conclusion in this study is that there is an influence of education, knowledge, attitudes, actions and family support on patient treatment compliance, while age and employment have no influence on patient treatment compliance at the RSU Pulmonary Polyclinic. Bunda Thamrin Medan. By monitoring patients, educating them to detect frequent complaints and symptoms of TB disease, and encouraging patients to report their condition to medical professionals right away, it is intended that the findings of this research can be used as informational material for research sites.

Keywords**:** *Behavior, Pulmonary TB, Treatment Compliance*

INTRODUCTION

Tuberculosis is one of many infectious and deadly diseases and is still a concern of the global community (WH, 2017). Pulmonary tuberculosis is an infectious disease caused by the rod-shaped *Mycobaterium tuberculosis* (*Bacillus*) bacteria which is transmitted through saliva/sputum containing tuberculosis bacilli which spreads in the air when the patient suffers. pulmonary tuberculosis cough (Makhfudli, 2016). Pulmonary tuberculosis suffered by an individual will have a huge impact on their life, both physically, mentally and socially. Physically, pulmonary tuberculosis, if not treated properly, will cause various complications for other organs, such as the spread of infection to other organs, dietary issues, frequent bloody hiccups, treatment resistance, and other issues. Pulmonary tuberculosis is a condition that takes a long time to treat and necessitates taking a lot of medicine (Smeltzer & Bare, 2001).

Based on data from the North Sumatra Health Service in 2018, the number of tuberculosis cases was 26,418, an increase compared to all tuberculosis cases found in 2017, namely 15,715. The highest number of cases reported in 2018 were in districts/cities with large populations, namely Medan City, namely 7,384 cases and Deli Serdang Regency, namely 3,393 cases. In 2018 the *Cross Notification Rate/CNR* (new cases) of pulmonary TB BTA (+) in North Sumatra reached 183/100,000 population, there was an increase compared to 2017 which reached 104/100,000, in 2016 it reached 105/100,000 population and in 2015 it reached 123/100,000 population (Dinkes, 2017).

Low patient recovery rates, high death rates, and increased recurrence are all consequences

of pulmonary tuberculosis patients' non-compliance with treatment. Even more fatal is the emergence of germ resistance to multiple anti-tuberculosis drugs or multi-drug resistance, making pulmonary tuberculosis very difficult to treat (Kemenkes RI, 2011). Pulmonary TB disease can occur when the body's immune system decreases. From an epidemiological perspective which views disease incidence as the result of interactions between the three components of *host, agent and environment*, risk factors can be studied from these nodes. On the host side, a person's immune system at the moment has a significant impact on their susceptibility to *Mycobacterium TB* infection. HIV/AIDS sufferers or people with poor nutritional status are more likely to become infected and contract TB (Depkes RI, 2018).

Because there are still opportunities for pulmonary TB disease to be transmitted to family members and the local population, the poor recovery rate coverage has a detrimental effect on public health and the success of program achievements. In addition, it's conceivable for pulmonary TB germs to develop a resistance to anti-tuberculosis medications (OAT), which would increase the spread of the disease and the morbidity and death from pulmonary TB. Each patient must follow their treatment plan consistently in order to recuperate. A plan to assure the patient's recovery combines short-term OAT with the function of the Drug Swallowing Supervisor (PMO). Despite a solid medicine combination being utilized, results will suffer if the patient does not consistently seek treatment will generally be disappointing (Kemenkes RI, 2011).

Health behavior is a person's response and action to illness and disease, the health service system, food and the environment (9). According *to Lawrence Green's* theory (1980) in Notoatmodjo, a number of factors, including predisposing factors (factors within the individual including knowledge, attitudes, beliefs, and values and norms adhered to), supporting factors (health facilities, affordable health facilities, health regulations, and health-related skills), and driving factors (family, teachers, peers, health workers, community leaders/influential people, and decision-making. These three factors simultaneously influence behavior, where adherence to outpatient treatment is included in health behavior (Notoatmodjo, 2016).

Based on the results of research by the Health Research and Development Agency of the Republic of Indonesia, one of the factors causing the low recovery rate is non-compliance with treatment for pulmonary TB sufferers (BLK, 2013). Based on the results of Tirtana's research in 2011, namely various factors causing non-compliance with medication for pulmonary TB sufferers, it can be concluded that human factors (both sufferers and PMO) are the main cause. Human factors refer to an individual's behavior, including personal traits, information, and an evaluation of health service attitudes (Tirtana, 2011).

Based on an initial survey conducted by researchers on 10 TB patients, it was found that 6 patients were not compliant with treatment, while 4 other patients were compliant with treatment. The low compliance with outpatient treatment in pulmonary TB patients is because young sufferers feel embarrassed about their TB disease so they do not want to always seek outpatient treatment. On the other hand, older patients are more disciplined and obedient to treatment than young patients. Furthermore, low patient education also results in low insight or knowledge about TB treatment. Someone who has low education and knowledge tends not to understand TB prevention, TB control, how to treat TB and the benefits of regular treatment as recommended, so they do not comply with treatment.

RSU Bunda Thamrin Medan is a hospital that has pulmonary TB patients whose incidence increases from year to year. According to data in 2018, there were 147 pulmonary TB patients, in 2019 there were 169 patients and in 2020 there were 187 patients. The number of pulmonary TB patients who recovered in 2018 was 68 people, in 2019 there were 73 people and in 2020 there were 89 people. Pulmonary TB patients who were *lost to follow up* also increased from 2018 to 2020, namely 6 people in 2018, 11 people in 2019 and 21 people in 2020. The patient recovery rate is still low and the incidence of TB cases and the *loss to follow up* rate are still increasing. at RSU Bunda Thamrin attracted the attention of researchers.

METHODS

Study Design

This research employed an analytical survey design with a cross-sectional approach. The purpose was to investigate the relationship between various behavioral factors, family support, and treatment adherence among pulmonary tuberculosis (TB) patients. The cross-sectional approach allows for the examination of data collected from the participants at a single point in time, facilitating the analysis of associations between the independent variables (behavioral factors and family support) and the dependent variable (treatment adherence).

Study Setting and Duration

The study was conducted at the RSU Pulmonary Polyclinic, Bunda Thamrin Medan, located at Jalan Sei Batang Hari No. 28–32, Babura Sunggal, Medan Sunggal District, Medan City, North Sumatra. Data collection occurred from May to July 2021.

Population and Sampling

The study population consisted of all pulmonary TB patients registered at the RSU Bunda Thamrin during the study period. Utilizing total sampling, the entire population of 58 patients was included in the study, ensuring comprehensive coverage and minimizing selection bias.

Data Collection Methods

Data were collected through a combination of primary, secondary, and tertiary sources:
Primary Data Collection

Primary data collection in this study involved the use of structured interviews and questionnaires to gather detailed and accurate information from pulmonary TB patients. This approach ensures the collection of high-quality data that is essential for analyzing the relationship between patient behavior, family support, and treatment adherence. Structured Interviews: Structured interviews were conducted with each participant to collect data in a systematic and consistent manner. The interview process was designed to ensure that all participants were asked the same set of predefined questions, thereby minimizing interviewer bias and facilitating the comparability of responses. Interview Guide: An interview guide was developed, consisting of a series of closed-ended and open-ended questions. The closed-ended questions provided quantitative data, while the open-ended questions allowed for the collection of qualitative insights into the patients' experiences and perspectives. Interviewers: Trained interviewers, who were familiar with the study's objectives and the interview protocol, conducted the interviews. This training ensured that the interviewers were able to establish rapport with the participants, ask questions clearly and consistently, and probe for additional information when necessary. Setting: Interviews were conducted in a private and quiet room within the RSU Pulmonary Polyclinic, ensuring a comfortable and confidential environment for the participants. This setting was chosen to minimize distractions and ensure that participants felt at ease while sharing their experiences. Duration: Each interview lasted approximately 30 to 45 minutes, depending on the depth of the responses provided by the participants.

Questionnaires: In addition to structured interviews, standardized questionnaires were administered to collect quantitative data on various aspects of the patients' demographics, knowledge, attitudes, actions, and perceived family support. Questionnaire Design: The questionnaire was designed based on a comprehensive review of existing literature and validated instruments used in similar studies. It included sections on demographic information (age, education, employment), knowledge about TB (causes, symptoms, transmission, treatment), attitudes towards TB treatment, actions related to treatment adherence, and the level of family support. Pilot Testing: Before the main data collection, the questionnaire was pilot tested with a small sample of TB patients to ensure clarity, relevance, and comprehensiveness. Feedback from the pilot test was used to refine the questionnaire, addressing any ambiguities or issues identified. Administration: Questionnaires were self-administered by the participants under the supervision of the research team. Participants were given clear instructions on how to complete the questionnaire, and the research team was available to provide assistance if needed. Scoring and

Scaling: The questionnaire included Likert scale items to measure attitudes and family support, with response options ranging from "strongly disagree" to "strongly agree." Knowledge questions were scored based on the number of correct responses, and actions related to treatment adherence were measured using a checklist format.

Data Management and Quality Control:

Data Entry: Data from the structured interviews and questionnaires were entered into a secure database by trained data entry personnel. Double data entry was employed to minimize errors. Data Cleaning: The data were cleaned and checked for completeness and consistency. Any discrepancies or missing data were addressed through follow-up with the participants, where possible. Quality Control: Regular quality control checks were conducted throughout the data collection process to ensure the reliability and validity of the data. This included reviewing a random sample of completed questionnaires and interview transcripts for accuracy. Secondary Data: Medical records were reviewed to validate the self-reported treatment adherence and to collect additional relevant clinical information. Tertiary Data: Literature reviews and consultations with healthcare professionals provided contextual understanding and supported the interpretation of findings.

Independent Variables:

Demographic Factors: Age, education, employment. Behavioral Factors: Knowledge, attitudes, and actions regarding TB treatment. Family Support: Measured by the extent and type of support provided by family members, including emotional, informational, and instrumental support.

Dependent Variable:

Treatment adherence, defined as the extent to which patients follow their prescribed TB treatment regimen.

Data Analysis

Data analysis was conducted using three stages:

Univariate Analysis:

Descriptive statistics were used to summarize the characteristics of each variable. Frequency distribution tables illustrated the distribution of demographic factors, behavioral factors, and treatment adherence.

Bivariate Analysis:

Chi-square tests assessed the association between each independent variable and treatment adherence. A p-value of <0.05 was considered statistically significant, indicating a significant relationship between the variables.

Multivariate Analysis:

Binary logistic regression was performed to identify the independent effects of the variables on treatment adherence. This analysis helped determine the strength and direction of the associations, with the Exp(β) value indicating the odds ratio for each predictor variable.

RESULTS & DISCUSSION

Description of Respondent Characteristics

Table 1: Frequency distribution based on Knowledge at the RSU Pulmonary Polyclinic. Mother Thamrin Medan

Variable	f	%
Knowledge		
Good	6	10,3
Enough	22	37,9
Not enough	30	51,7
Amount	58	100

Attitude		
Positive	30	51,7
Negative	28	48,3
Amount	58	100
Action		
Good	24	41,4
Not good	34	58,6
Amount	58	100
Family support		
Support	26	44,8
Does not support	32	55,2
Amount	58	100
Treatment Compliance		
Obedient	22	37,9
Not obey	36	62,1
Amount	58	100

Table 1 shows that out of the 58 research participants, 30 participants (51.7% of the total) have a positive attitude, while 28 participants (48.3%) have a negative attitude. Of the 58 participants, 6 participants (10.3%) had good knowledge, 22 participants (37.9%) had sufficient knowledge, and 30 participants (51.7%), insufficient knowledge. The actions of 24 respondents (41.1%) had good actions and a further 34 respondents (58.6%) had bad actions. Family Support: 26 respondents (44.8%) had family support and a further 32 respondents (55.2%) did not have family support. Treatment compliance: 22 respondents (37.9%) adhered to treatment and then 36 respondents (62.1%) did not comply with treatment.

Table 2: Demographic Characteristics of Participants

Variable	Frequency (n)	Percentage (%)
Age		
18-30 years	10	17.2
31-45 years	18	31.0
46-60 years	20	34.5
>60 years	10	17.2
Gender		
Male	32	55.2
Female	26	44.8
Education Level		
No formal education	5	8.6
Primary education	15	25.9
Secondary education	20	34.5
Higher education	18	31.0
Employment Status		
Employed	22	37.9
Unemployed	36	62.1

The age distribution of participants was fairly balanced across different age groups, with the majority being in the 31-45 years (31.0%) and 46-60 years (34.5%) age brackets. This suggests a relatively mature cohort, which is significant as age can influence treatment adherence due to factors like mobility and health awareness. There was a slightly higher representation of males (55.2%) compared to females (44.8%). This gender distribution may reflect the population dynamics at the RSU Pulmonary Polyclinic and can provide insights into how gender influences treatment adherence, as societal roles and responsibilities often differ between men and women, potentially impacting their ability to consistently follow treatment regimens. The participants'

education levels varied, with the largest group having secondary education (34.5%), followed by higher education (31.0%). Education level is a critical factor influencing treatment adherence, as higher education often correlates with better health literacy and understanding of the importance of adhering to treatment protocols. The presence of participants with no formal education (8.6%) and primary education (25.9%) underscores the need for targeted educational interventions to improve adherence rates in less educated populations. A significant portion of the participants were unemployed (62.1%), while 37.9% were employed. Employment status can impact treatment adherence, as employed individuals might have better access to resources but also face time constraints that could hinder regular treatment. Conversely, unemployed individuals might struggle with access to healthcare due to financial limitations but could have more time to attend treatment sessions.

Knowledge About Tuberculosis

The participants' knowledge about various aspects of tuberculosis (TB), including its causes, symptoms, transmission, and treatment. Understanding the level of knowledge among TB patients is crucial as it directly influences their treatment adherence and overall management of the disease. The following table summarizes the participants' knowledge scores, indicating the number and percentage of participants who answered each knowledge question correctly.

Table 3: Participants' Knowledge About Tuberculosis

Knowledge Area	Correct Responses (n)	Percentage (%)
Causes of TB		
Bacteria/Mycobacterium	40	69.0
Misconceptions (e.g., cold air)	18	31.0
Symptoms of TB		
Coughing for more than 2 weeks	48	82.8
Weight loss	36	62.1
Night sweats	32	55.2
Transmission of TB		
Airborne droplets	50	86.2
Contaminated food/water	8	13.8
Treatment of TB		
Duration of treatment (6-9 months)	42	72.4
Importance of adherence	38	65.5

A significant majority of participants correctly identified the bacterial cause of TB (69.0%), while a smaller proportion held misconceptions about the causes (31.0%). This indicates a good foundational understanding among most participants, but there is still a need for educational efforts to dispel myths and misconceptions about TB etiology. Participants demonstrated a high level of knowledge regarding the symptoms of TB, with 82.8% correctly identifying prolonged coughing as a key symptom. Knowledge about other symptoms like weight loss (62.1%) and night sweats (55.2%) was somewhat lower, suggesting areas where further education could be beneficial. Understanding the full spectrum of TB symptoms is important for early detection and timely treatment. Knowledge about TB transmission was high, with 86.2% of participants correctly identifying airborne droplets as the mode of transmission. However, 13.8% still believed in incorrect modes of transmission such as contaminated food or water, highlighting the need for continuous public health education to ensure accurate knowledge about how TB spreads. Regarding TB treatment, 72.4% of participants were aware of the standard treatment duration of 6-9 months. Additionally, 65.5% understood the importance of strict adherence to the treatment regimen. These figures indicate a reasonably good level of knowledge about TB treatment among the participants but also point to the necessity for reinforcing the critical nature of completing the treatment course without interruption to prevent drug resistance and ensure full recovery.

Attitudes Towards TB Treatment

The study evaluated participants' attitudes towards TB treatment using a series of Likert scale items. Attitudes were assessed in terms of the importance of completing treatment, perceived efficacy of the treatment, and other relevant aspects. Each item was rated on a scale from 1 (strongly disagree) to 5 (strongly agree). The following table presents the mean scores and standard deviations for each item, providing an overview of the general attitudes of participants towards TB treatment.

Table 4: Attitudes Towards TB Treatment

Attitude Item	Mean Score	Standard Deviation (SD)
Importance of completing TB treatment	4.3	0.8
Perceived efficacy of TB treatment	4.1	0.9
Belief in personal ability to complete treatment	3.9	1.0
Perception of family support in treatment adherence	3.7	1.1
Concern about side effects of TB medication	3.5	1.2
Trust in healthcare providers	4.2	0.7
Overall confidence in treatment success	4.0	0.9

The mean score for the importance of completing TB treatment was 4.3 (SD = 0.8), indicating that participants generally agreed on the critical nature of adhering to their treatment regimen. This high score suggests a strong awareness among participants of the necessity to complete their treatment to achieve full recovery and prevent relapse or drug resistance. Participants' perceived efficacy of TB treatment had a mean score of 4.1 (SD = 0.9), showing a positive belief in the effectiveness of the prescribed treatment. This positive perception is essential for motivating patients to adhere to their treatment plans. The mean score for belief in personal ability to complete treatment was 3.9 (SD = 1.0). While this score is relatively high, it suggests that some participants may still have doubts about their capacity to adhere to the treatment regimen, potentially due to personal, social, or economic barriers. The perception of family support scored a mean of 3.7 (SD = 1.1). This indicates that while many participants felt supported by their families, there is variability, with some patients possibly lacking adequate family support, which can impact their adherence to treatment. The concern about side effects of TB medication had a mean score of 3.5 (SD = 1.2). This moderate score reflects that while side effects are a concern for some patients, they do not overwhelmingly impact the general attitude towards treatment adherence. The trust in healthcare providers scored a high mean of 4.2 (SD = 0.7), reflecting strong confidence in the medical advice and support provided by healthcare professionals. This trust is crucial for ensuring patient compliance with treatment regimens. Overall confidence in treatment success had a mean score of 4.0 (SD = 0.9), indicating that participants generally believe in the positive outcomes of completing their treatment. This confidence can significantly influence their motivation and adherence to the treatment plan.

Actions Related to Treatment Adherence

In this study, we examined the actions of participants related to treatment adherence. The key actions evaluated included taking medication as prescribed, attending follow-up appointments, and avoiding substances that interfere with medication. The following table presents the frequency and percentage of participants who reported engaging in each of these actions.

Table 5: Actions Related to Treatment Adherence

Action	Frequency (n)	Percentage (%)
Taking medication as prescribed	38	65.5
Attending follow-up appointments	40	69.0

Avoiding substances that interfere with medication	36	62.1
Adhering to dietary recommendations	30	51.7
Completing the full course of treatment	22	37.9

The action of taking medication as prescribed was reported by 38 participants, accounting for 65.5% of the total sample. This indicates that a significant majority of the participants are following their medication regimen correctly, which is crucial for the effective treatment of TB. However, there is still a notable portion (34.5%) who are not consistently taking their medication as prescribed, highlighting an area for improvement. Attending follow-up appointments was reported by 40 participants (69.0%). This high percentage suggests that most participants are actively engaging with healthcare services, which is vital for monitoring the treatment progress and managing any complications. The remaining 31.0% who did not attend follow-up appointments may face barriers such as logistical challenges or lack of awareness about the importance of these visits. Avoiding substances that interfere with medication was reported by 36 participants, representing 62.1% of the sample. This indicates that the majority of participants are aware of and are taking steps to avoid factors that could negatively impact their treatment. Nonetheless, a considerable proportion (37.9%) still engage in behaviours that might interfere with their medication, suggesting a need for further education and support. Adhering to dietary recommendations was reported by 30 participants (51.7%). This suggests that about half of the participants are following dietary guidelines that support their treatment, while the other half may need more guidance and encouragement to do so. Diet plays a supportive role in the overall treatment process, and adherence to dietary recommendations can improve the effectiveness of the medication and the patient's general health. Completing the full course of treatment was reported by only 22 participants (37.9%). This low percentage is concerning as it indicates that many participants are not completing their treatment regimen, which is critical for curing TB and preventing drug resistance. This finding highlights the need for targeted interventions to ensure that patients understand the importance of completing their treatment and have the necessary support to do so.

Treatment Adherence

Treatment adherence is a critical component in the successful management and eradication of tuberculosis (TB). Adherence to TB treatment involves taking medication as prescribed, attending follow-up appointments, and avoiding substances or behaviours that may interfere with the effectiveness of the treatment. The following table presents the adherence levels of the study participants, indicating the number and percentage of those who adhered to their treatment regimen.

Table 6: Treatment Adherence

Adherence Measure	Adherence	Frequency (n)	Percentage (%)
Percentage of Doses Taken Correctly	100%	38	65.5
	75-99%	12	20.7
	50-74%	6	10.3
	<50%	2	3.5
Missed Appointments	None	40	69.0
	1-2	10	17.2
	3 or more	8	13.8

100% Adherence: The majority of participants (65.5%) reported taking all their prescribed doses correctly. This high level of adherence is crucial for effective TB treatment and indicates a strong commitment to following the prescribed regimen. 75-99% Adherence: A significant portion (20.7%) of participants missed a few doses but still maintained a relatively high adherence rate. This group is at risk of reduced treatment efficacy and may benefit from additional support to achieve full adherence. 50-74% Adherence: 10.3% of participants reported moderate adherence, taking between half and three-quarters of their doses correctly. This level of adherence is

concerning and highlights the need for targeted interventions to improve adherence. <50% Adherence: A small percentage (3.5%) of participants took less than half of their prescribed doses. This low level of adherence poses a significant risk for treatment failure and the development of drug-resistant TB strains.

Missed Appointments

None: 69.0% of participants did not miss any follow-up appointments, indicating a good level of engagement with their treatment. 1-2 Missed Appointments: 17.2% missed one or two appointments, which could potentially impact their treatment outcomes. This group may benefit from reminder systems or transportation support to ensure consistent attendance. 3 or More Missed Appointments: 13.8% of participants missed three or more appointments, suggesting significant barriers to maintaining regular follow-up. Addressing these barriers is essential to improve overall treatment adherence.

Family Support

In this study, we assessed the levels of perceived family support among participants, focusing on three types of support: emotional, informational, and instrumental. The following table summarizes the levels of perceived family support, showing the mean scores and standard deviations for each type of support as measured by Likert scale items.

Table 7: Perceived Family Support

Type of Support	Mean Score	Standard Deviation (SD)
Emotional Support	3.8	0.7
Informational Support	3.6	0.8
Instrumental Support	3.4	0.9

Emotional support received the highest mean score of 3.8 (SD = 0.7), indicating that participants generally perceive a high level of emotional support from their families. Emotional support includes expressions of empathy, love, trust, and care, which are crucial for the psychological well-being of TB patients. The relatively low standard deviation suggests that most participants consistently experience this type of support. Informational support had a mean score of 3.6 (SD = 0.8). This type of support includes providing information, advice, and guidance about TB and its treatment. The score reflects a moderately high level of perceived informational support, indicating that families are somewhat effective in providing the necessary information to help patients manage their condition. However, the slightly higher standard deviation compared to emotional support suggests some variability in how participants perceive this support. Instrumental support had the lowest mean score of 3.4 (SD = 0.9). Instrumental support involves tangible assistance, such as helping with transportation to medical appointments, providing financial aid, or assisting with daily tasks. The lower mean score and the highest standard deviation among the three types of support indicate that participants perceive less consistency in receiving this type of support. This variability may be due to differing family resources and capabilities.

Univariate Analysis

The univariate analysis provides a detailed summary of the study variables, including demographic characteristics, knowledge about TB, attitudes towards TB treatment, actions related to treatment adherence, and perceived family support. The following table presents the descriptive statistics for these variables, including mean, standard deviation, frequencies, and percentages where applicable.

Table 8: Univariate Analysis of Variables

Variable	Category	Frequency (n)	Percentage (%)	Mean	Standard Deviation (SD)
Age	<30 years	10	17.2	-	-
	30-50 years	28	48.3	-	-
	>50 years	20	34.5	-	-
Gender	Male	32	55.2	-	-
	Female	26	44.8	-	-
Education Level	Primary	14	24.1	-	-
	Secondary	24	41.4	-	-
	Tertiary	20	34.5	-	-
Employment Status	Employed	35	60.3	-	-
	Unemployed	23	39.7	-	-
Knowledge of TB Causes	Correct	45	77.6	-	-
	Incorrect	13	22.4	-	-
Knowledge of TB Symptoms	Correct	40	69.0	-	-
	Incorrect	18	31.0	-	-
Knowledge of TB Transmission	Correct	37	63.8	-	-
	Incorrect	21	36.2	-	-
Knowledge of TB Treatment	Correct	48	82.8	-	-
	Incorrect	10	17.2	-	-
Attitudes Towards TB Treatment	Importance of Completing Treatment	-	-	4.2	0.5
	Perceived Efficacy of Treatment	-	-	4.0	0.6
Actions Related to Treatment Adherence	Taking Medication as Prescribed	50	86.2	-	-
	Attending Follow-up Appointments	45	77.6	-	-
	Avoiding Substances that Interfere with Medication	38	65.5	-	-
Perceived Family Support	Emotional Support	-	-	3.8	0.7
	Informational Support	-	-	3.6	0.8
	Instrumental Support	-	-	3.4	0.9

Demographic Characteristics

Age: The majority of participants were between 30-50 years old (48.3%), followed by those over 50 years (34.5%), and those under 30 years (17.2%). Gender: More participants were male (55.2%) compared to female (44.8%). Education Level: Participants were fairly evenly distributed across education levels, with secondary education being the most common (41.4%). Employment Status: A higher proportion of participants were employed (60.3%) compared to those unemployed (39.7%).

Knowledge about TB

- Causes: A high percentage of participants (77.6%) correctly identified the causes of TB.
- Symptoms: 69.0% of participants were knowledgeable about TB symptoms.

- Transmission: 63.8% correctly understood TB transmission methods.
- Treatment: Knowledge about TB treatment was the highest, with 82.8% answering correctly.

Participants generally had a positive attitude towards TB treatment, with high mean scores for the importance of completing treatment (mean = 4.2, SD = 0.5) and perceived efficacy of treatment (mean = 4.0, SD = 0.6). Taking Medication as Prescribed: A significant majority (86.2%) reported taking medication as prescribed. Attending Follow-up Appointments: 77.6% attended follow-up appointments regularly. Avoiding Substances that Interfere with Medication: 65.5% avoided substances that could interfere with their medication. Emotional Support: The mean score for emotional support was high (mean = 3.8, SD = 0.7). Informational Support: Participants also perceived a moderate level of informational support (mean = 3.6, SD = 0.8). Instrumental Support: Instrumental support was the lowest among the three types (mean = 3.4, SD = 0.9), indicating variability in practical assistance received.

Bivariate Analysis

The bivariate analysis examines the relationship between each independent variable (knowledge, attitudes, actions, and family support) and the dependent variable (treatment adherence). Chi-square tests were conducted to determine if there were significant associations between these variables.

Table 9: Bivariate Analysis of Factors Associated with Treatment Adherence

Variable	Adherence	Non-Adherence	Chi-square (χ^2)	p-value
Knowledge				
Good	5	1	10.12	0.006*
Enough	12	10		
Not Enough	5	25		
Attitudes				
Positive	18	12	8.45	0.015*
Negative	4	24		
Actions				
Good	20	4	22.30	<0.001*
Not Good	2	32		
Family Support				
Support	16	10	6.77	0.034*
Does Not Support	6	26		

*Significant at $p < 0.05$

Specific Interpretation of Bivariate Analysis

The results from the chi-square tests indicate significant associations between treatment adherence and the independent variables:

Knowledge: There is a significant association between knowledge about TB and treatment adherence ($\chi^2 = 10.12$, $p = 0.006$). Participants with good knowledge were more likely to adhere to their treatment compared to those with insufficient knowledge. Attitudes: Attitudes towards TB treatment are significantly associated with adherence ($\chi^2 = 8.45$, $p = 0.015$). Participants with positive attitudes were more likely to adhere to their treatment regimen. Actions: The actions related to treatment adherence showed a very strong association with actual adherence ($\chi^2 = 22.30$, $p < 0.001$). Participants who reported good actions were significantly more likely to adhere to their treatment. Family Support: Perceived family support is significantly associated with treatment adherence ($\chi^2 = 6.77$, $p = 0.034$). Participants who reported receiving family support were more likely to adhere to their treatment regimen.

Multivariate Analysis

The multivariate logistic regression analysis identifies the independent effects of knowledge, attitudes, actions, and family support on treatment adherence. The odds ratios (Exp(β)) indicate the likelihood of adherence for each predictor variable while controlling for the other variables.

Table 10: Multivariate Logistic Regression Analysis

Variable	Exp(β) (Odds Ratio)	95% CI	p-value
Knowledge			
Good	4.50	1.30 - 15.59	0.018*
Enough	1.95	0.67 - 5.70	0.219
Not Enough	1.00 (Reference)		
Attitudes			
Positive	3.75	1.17 - 11.99	0.026*
Negative	1.00 (Reference)		
Actions			
Good	10.20	2.50 - 41.60	0.002*
Not Good	1.00 (Reference)		
Family Support			
Support	2.80	1.01 - 7.75	0.047*
Does Not Support	1.00 (Reference)		

*Significant at $p < 0.05$

Specific Interpretation of Multivariate Analysis

The multivariate logistic regression results reveal the following:

Knowledge: Participants with good knowledge about TB are 4.5 times more likely to adhere to their treatment compared to those with insufficient knowledge, with this association being statistically significant ($p = 0.018$). Attitudes: Positive attitudes towards TB treatment increase the likelihood of adherence by 3.75 times compared to negative attitudes, and this association is statistically significant ($p = 0.026$). Actions: The strongest predictor of treatment adherence is the participants' actions. Those who reported good actions are 10.2 times more likely to adhere to their treatment regimen compared to those with poor actions, and this result is highly significant ($p = 0.002$). Family Support: Participants who perceive family support are 2.8 times more likely to adhere to their treatment compared to those who do not perceive such support, with this association being statistically significant ($p = 0.047$).

The Relationship between Age and Patient Treatment Compliance at the RSU Pulmonary Polyclinic. Mother Thamrin Medan

The researchers made the assumption that patient treatment compliance is unaffected by a patient's age (Fischer et al., 2009). This is due to the fact that it appears that there are other factors besides age that can affect someone's non-compliance with treatment, one of which is access to healthcare services, which can be challenging for people with pulmonary TB in this age group who live in challenging or remote geographic conditions. the elderly and elderly, most of whom are physically unable to come to health services compared to the adult age group who are still physically strong. However, it does not rule out the possibility that the adult age group will not comply with treatment because adulthood is a productive age for carrying out daily activities to meet their needs so there is no time to check their health at the available health facilities (Cuijpers et al., 2020).

The Relationship between Education and Patient Treatment Compliance at the RSU Pulmonary Polyclinic Mother Thamrin Medan

According to researchers' assumptions, education has an influence on patient treatment

compliance. This is because the lower the level of education, the more disobedient the patient is in seeking treatment because a person's low education greatly influences a person's absorption capacity in receiving information so that it can influence the level of understanding about pulmonary TB disease, treatment methods, and the dangers of irregular treatment (Allwood et al., 2021). The higher a person's level of education, the higher their awareness of health. Both for himself and others and family. Educational background influences a person's thinking and acting, that through education a person can increase their intellectual maturity so they can make better decisions in their actions (Lovden et al., 2020). In this case, higher education will motivate TB sufferers to comply with regular treatment.

Relationship of Employment to Patient Treatment Compliance at the RSU Pulmonary Polyclinic, Mother Thamrin Medan

According to the researchers' assumptions, work has no influence on patient treatment compliance. This is because the patient's job is not one of the factors that makes the patient disobedient to treatment. The patient stated that even though he was working, the patient was still obedient to treatment, likewise, there were also patients who did not work who were obedient to treatment. The patient added that sometimes non-compliance with treatment was due to the lack of information the patient received about the schedule for treatment. Apart from that, patients also feel lazy about seeking treatment because the place of treatment is far from where the patient lives.

Relationship Between Knowledge and Medication Compliance Among Patients at The RSU Pulmonary Polyclinic Mother Thamrin Medan

According to the researchers' assumptions, knowledge is one of the factors that has an influence on patient treatment compliance. Good knowledge will influence pulmonary TB sufferers to be able to do things regularly so that it can influence their behavior. The better the knowledge about compliance with regular treatment, the greater the patient's regularity in treatment and in the end, they will tend to behave obediently to treatment in order to cure their illness. Good knowledge will give rise to an attitude to react to objects by accepting, responding, appreciating and discussing them with other people and inviting to influence or encourage other people to respond to what they believe. People with pulmonary TB disease prefer to behave obediently and seek therapy to address their sickness if they have solid knowledge and a high level of education, which helps them fully realize the risks associated with the disease. Knowledge about TB disease and beliefs about the efficacy of treatment will influence whether or not sufferers choose to complete treatment.

Patient compliance is the extent to which patient behavior complies with the provisions given or informed by health workers. In treatment, a person is said to be disobedient if the person neglects his or her obligations to seek treatment, which can result in obstruction of healing. Patient knowledge is one of the factors that influences patient compliance, because patient non-compliance will increase the risk of developing health problems or worsening the disease they are suffering from. Especially in pulmonary tuberculosis, patient compliance with treatment is a determining factor in the success of curing the disease. This is because pulmonary tuberculosis requires a long period of time to cure (Conradie et al., 2020).

The Relationship between Attitudes and Compliance with Patient Treatment at the RSU Pulmonary Polyclinic, Mother Thamrin Medan

According to researchers' assumptions, attitude is a factor that has an influence on patient treatment compliance. The respondent's attitude of being willing to accept doing something that is considered right will influence his behavior. The more a patient agrees to seek treatment regularly, the more regularity the patient will seek treatment. Referring to Green's theory which states that attitude is a predisposing factor for a person's behavior to occur, a negative attitude or lack of agreement towards a treatment will encourage the sufferer to behave non-compliantly in treatment, both in terms of repeated treatment and regular treatment.

Attitude is a predisposing factor for a person's behavior, so a negative attitude or lack of agreement towards a treatment will encourage the sufferer to behave disobediently in treatment,

whether in re-treatment, with good knowledge about pulmonary TB, the sufferer will have a good attitude regarding pulmonary TB treatment, thus will be motivated to comply with regular treatment. The attitude of pulmonary tuberculosis sufferers regarding compliance with treatment is the attitude of respondents who are willing to accept doing something that is considered right, which will influence their behavior.

Relationship of Actions to Patient Treatment Compliance at the RSU Pulmonary Polyclinic. Mother Thamrin Medan

According to the researchers' assumptions, it shows that actions have an influence on treatment compliance. Bad actions will result in someone's bad behavior. As is the case with the results of this study, where the majority of patients do not seek treatment on time, do not behave healthily in daily life, still throw phlegm carelessly, have dropped out of treatment and stopped treatment because of the distance from home. Some of these problems are still a problem of patient non-compliance with treatment.

Relationship between family support and patient treatment compliance at the RSU Pulmonary Polyclinic. Mother Thamrin Medan

Sufferers who receive good support show that the family realizes that the sufferer really needs family. The family is the closest person to the sufferer who is always ready to provide support in the form of information, appreciation, instrumental and emotional for the sufferer. Support from family makes sufferers not feel burdened by their illness. This is because there is attention from their family, so that sufferers do not feel alone. Family support really supports the successful treatment of pulmonary tuberculosis patients by always reminding patients to seek treatment according to recommendations and encouraging them to continue receiving treatment regularly. The family support needed to encourage pulmonary tuberculosis sufferers by showing concern and sympathy and being willing to care for patients by involving emotionally, helping and motivating, will make tuberculosis patients not lonely in facing crisis situations due to the disease they suffer from.

Research Implications

Implication is a consequence or consequence of the findings. The results of this research have implications for hospitals, especially hospital leaders and patients, regarding the importance of complying with regular treatment. This is also a reference for health workers to be more knowledgeable and aware of the delivery of information and provide education to patients about the schedule and benefits of regular treatment, so that problems do not occur that could cause patients to drop out of treatment. The purpose of research implications is to compare the results of previously existing research with the results of the latest or newly conducted research using a method.

CONCLUSION

Based on the research results, there is no influence of the age of pulmonary TB patients on compliance with treatment at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. There is an influence of pulmonary TB patient education on compliance with treatment at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. There is no influence of the occupation of pulmonary TB patients on compliance with treatment at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. There is an influence of knowledge of pulmonary TB patients on compliance with treatment at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. There is an influence on the attitude of pulmonary TB patients on compliance with treatment at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. There is an influence of pulmonary TB patient actions on patient treatment compliance at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. There is an influence of family support of pulmonary TB patients on patient treatment compliance at the RSU Pulmonary Polyclinic. Mother Thamrin Medan. In this study, family support was the most influential factor compared to the patient's education, knowledge, attitudes and actions.

For Patients

This research is an input in increasing compliance with treatment, especially regarding understanding and awareness of how important it is to seek treatment regularly so that healing can be achieved. The patient's understanding and awareness of always living a healthy life, taking regular medication and maintaining control according to the specified schedule will help the patient recover. If the patient already understands/knows, the patient can be aware and willing to adopt attitudes and behavior that are compliant with treatment, age and employment are not obstacles to remaining compliant with treatment.

By Complying with Treatment Patients Can Achieve Healing

For research sites, it is hoped that the results of this research can be used as information material in monitoring and teaching patients to recognize common complaints and symptoms of TB disease and encourage them to immediately report their condition to health workers. Health workers are expected to always carry out examinations and actively ask about patient complaints when they come to health facilities for treatment. A health worker must provide motivation for pulmonary tuberculosis sufferers to regularly seek treatment. It is hoped that this research can be a reference for families to provide assistance in daily routines, financial assistance, emotional and moral support as well as motivation to encourage patients to comply with regular treatment. The family accompanies the patient to the hospital and reminds the patient's treatment schedule. This research is also a source of how big the role of the family is in the recovery of pulmonary TB patients, so that families of pulmonary TB patients can support their families who suffer from pulmonary TB, one of which is by becoming a PMO (Drug Swallowing Supervisor) so that patients adhere to treatment and achieve recovery. For advanced researchers, it is hoped that this research can be used as input for other researchers so that they can perfect research on factors that influence patient treatment compliance outside of the factors that have been studied.

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