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Analysis of Adherences and Effectiveness in Tuberculosis Patients at a Hospital in West Java Province in Indonesia

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Abstract

Tuberculosis (TB) TB disease is still a health threat both worldwide and in Indonesia. Cases of TB disease in Majalengka District continued to increase in 2020, with as many as 9,497 cases; in 2021, as many as 12,692 cases; and in 2022, a significant increase of 21,956 cases. This study aims to determine patient characteristics, level of adherence, and effectiveness of TB treatment, as well as the relationship between adherence and effectiveness of TB treatment in a hospital in Majalengka District in West Java. The research method used was descriptive observational analysis with retrospective data collection based on TB patient treatment cards. Adherence data was collected by completing the MMAS-8 questionnaire, and effectiveness data were collected by recording sputum examination results using SITB software. The sample is the total population according to the criteria. The technique used to draw this sample was total sampling, namely the total number of TB patients in a Hospital from November 2023 to April 2024, which was 45 patients. Data analysis was done using the Chi-square test. A total of 95.6% had a high level of adherence, and 4.4% of patients had moderate adherence. The efficacy of TB treatment was 100%, with 97.8% cured status and 2.2% complete treatment. There was a significant relationship between adherence and TB treatment effectiveness, with a p-value of 0.044 (sig<0.05).

Keywords: Adherence, effectiveness, hospital, tuberculosis.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis (MTB) that can affect the lungs and other organs (Kemenkes RI, 2021). TB disease is still a health threat both globally and in Indonesia, with a high number of cases and deaths. The World Health Organization (WHO) released its annual report on TB on 7 November 2023. According to the report, there are an estimated 10.6 million TB cases and 1.4 million TB deaths worldwide. Indonesia currently has the second-highest number of TB cases in the world. The number of TB cases in Indonesia in 2022 was 1,060,000 (Global TB Report, 2023).

The distribution of TB cases in Indonesia also varies between provinces and districts/cities. The five provinces with the highest estimated number of TB cases are West Java, East Java, Central Java, North Sumatra, and DKI Jakarta. TB cases in these five provinces accounted for 49% of all TB cases in Indonesia (Rondonuwu *et al*., 2022). Majalengka District is one of the areas in West Java with a high number of TB cases.

Based on data from the Majalengka District Health Office, from 2020 to 2022, the number of TB cases continued to increase, with 9,497 cases in 2020, 12,692 cases in 2021, and a significant increase to 21,956 cases in 2022, with a success rate of 87.7% (Dinkes Majalengka, 2023). The number of bacteriologically diagnosed pulmonary TB patients in the hospital where the research was conducted in 2022 was 274 cases, and the TB treatment success rate was 74% (target success rate 90%).

Tuberculosis is a chronic disease, and adherence is one of the keys to successful treatment. The possibility of patient non-adherence during TB treatment is very high. This non-adherence can occur due to several things, including the use of drugs in the long term, the amount of drugs taken is quite a lot, and the lack of awareness of the patient about the disease (Noveyani & Martini, 2014). Therefore, it is necessary to analyze TB

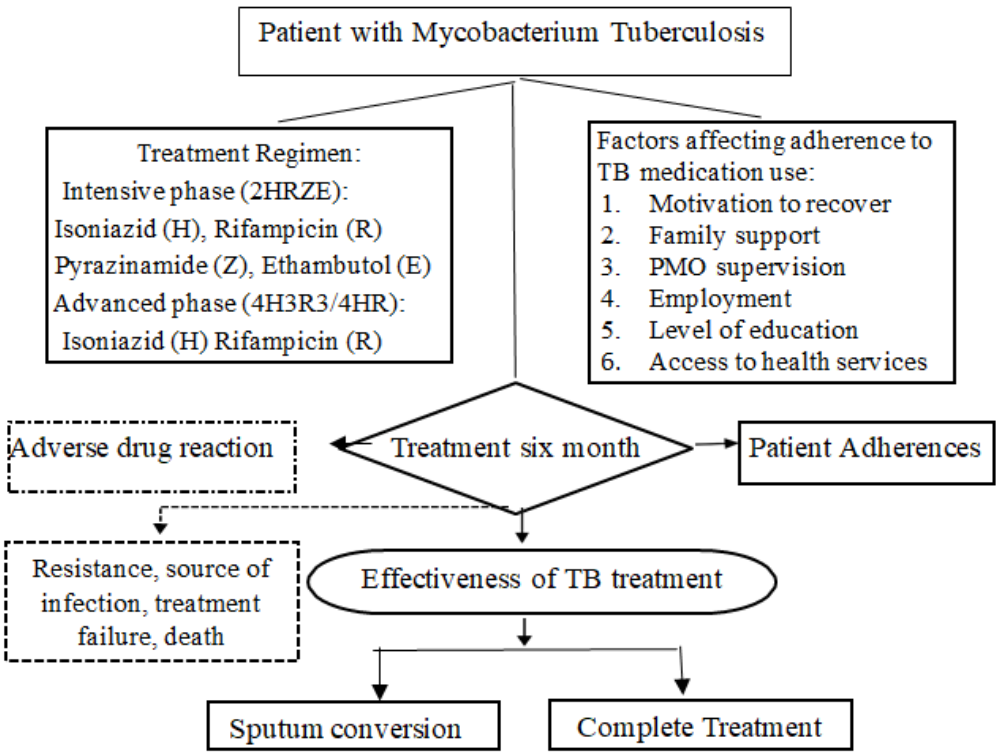
treatment adherence so that the success of therapy can be achieved.

The cure rate is useful for knowing the effectiveness of DOTS standard anti-TB drugs when administered to TB patients in a community (Noveyani & Martini, 2014). In a study by Safari *et al*., (2019), the effectiveness of OAT use in patients consists of two treatment outcomes, namely cured and complete, with patients with cured treatment outcomes at 62% and patients with complete treatment outcomes at 38% (Safari *et al*., 2019). In 2022, the success rate of drug-sensitive TB treatment was 86%, which still did not meet the national target of 90% set in the Ministry of Health's strategic plan. According to (Atika *et al*., 2015), success in the treatment of TB is when the patient completes the full course of treatment and then has another sputum test and gets a negative BTA (Acid Resistant Bacillus) result (-) so that the patient can be said to be cured.

The hospital where the research was conducted was a referral center for pulmonary TB treatment and counseling services in Majalengka District. The Hospital TB DOTS clinic is a part of the hospital where treatment and counseling services are organized specifically for pulmonary TB patients. At the hospitals, no research has been conducted to analyze the adherence and effectiveness of TB treatment in pulmonary TB patients.

MATERIAL AND METHODS

Conceptual Framework



Objective

This study aimed to determine the relationship between treatment efficacy and adherence with the use of anti-tuberculosis drugs at hospital, by distributing the MMAS-8 questionnaire directly to the respondents, which contained 8 questions that had to be answered by the respondents.

Population

Population is a generalized area consisting of objects or subjects with certain qualities and characteristics set by the researcher in order to study and draw conclusions (Sugiyono, 2019). The population used in this study were outpatient pulmonary tuberculosis patients who sought treatment at the TB DOTS clinic at a hospital in Majalengka, who were diagnosed with bacteriological pulmonary tuberculosis in November 2023 and continued treatment until the end of the follow-up period in April 2024, a total of 45 patients.

Sample

The sample is a part of the number and characteristics possessed by the population (Sugiyono, 2019). In this study, outpatient pulmonary tuberculosis patients who seek treatment at the TB DOTS clinic at a Hospital in Majalengka District receive treatment until the end of the advanced phase of treatment.

Sampling Technique

The population in this study were pulmonary tuberculosis patients who had taken anti-tuberculosis drugs for 6 months, a total of 45 bacteriologically diagnosed pulmonary tuberculosis patients. In this study, the sample was total because the population was less than

100, so the entire population was used as the research sample (Sugiyono, 2019).

A purposive sampling method is used to meet the inclusion and exclusion criteria. The purposive sampling method is sampling based on certain considerations made by the researcher himself based on previously known characteristics or properties of the population (Notoatmodjo, 2012). So that the character of the sample does not deviate from the population, then before sampling, the inclusion and exclusion criteria are first determined. Inclusion and exclusion criteria are as follows:

Inclusion Criteria:

1) Adult TB patients, both male and female, aged 17-65 years.
2) Pulmonary TB patients at the end of the advanced phase of treatment.
3) Patients diagnosed with pulmonary tuberculosis by bacteriological examination either with or without complications of other diseases.
4) Patients willing to participate in the study by signing an informed consent.

Exclusion Criteria:

1) Patients who have discontinued treatment
2) Patients who have died
3) Incomplete data
4) TB-HIV patients

Research Methods

This study uses an observational (non-experimental) method, which means that this research is conducted on events that have occurred and the cause is not due to the researcher's treatment/intervention. Prospective data collection, where this research aims to look into the future. This study was conducted by looking at sputum examination data of TB patients at the end of the continuation phase of treatment. In order to determine the level of adherence to the use of anti-tuberculosis drugs, the MMAS-8 questionnaire was completed, which consisted of questions about the patient's discipline in carrying out treatment therapy.

Processing Technique

Data on patient characteristics, including gender, age, education profile, and employment profile, were then processed and categorized. Data were presented as percentages and described descriptively. Meanwhile, the effectiveness of pulmonary tuberculosis treatment is seen from the percentage of treatment success by bacteriological examination/sputum test, which is characterized by positive to negative conversion at the end of the continuation phase of treatment. The processing of the results of filling in the MMAS-8 questionnaire on treatment adherence was carried out by giving a score of 1 if "no" and a score of 0 if "yes" to the questions numbered 1 to 7, except for number 5. The level of adherence of the respondents was grouped into 3 levels, namely low adherence with a score of less than 6, moderate adherence with a score of 6 to less than 8, and high adherence with a score of 8.

Data Analysis

The data analysis used in this study was univariate analysis and bivariate analysis. Univariate analysis is an analysis performed on each variable, and the results of the survey are analyzed so that the distribution and percentage of each variable are known. Univariate analysis includes data on age, sex, employment status, education, and patient adherence.

Bivariate analysis was performed on variables that were suspected to be related or correlated. Bivariate analysis is the independent variable in this study, namely patient characteristics and level of adherence. The dependent variable treatment efficacy is the result of the BTA sputum examination. The data obtained in this study were presented in tabular form and then analyzed using non-parametric statistical tests, namely the chi-square test; the significance level used was 95%, using a significance value or p of 5% to determine the relationship between treatment effectiveness and adherence with the use of antituberculosis drugs.

RESULTS AND DISCUSSION

Characteristics of TB patients

Based on the pre-defined inclusion criteria, 45 respondents were obtained. Data on the characteristics of TB patients explain gender, age, education, employment status, monthly income, family support, motivation to recover, monitoring of drug taking, and distance to hospital as described in the table below:

Table 1: Data on TB Patient Characteristics

No	Variable	Category	Frequency, n=45	Percentage (%)
1	Gender	Male	23	51,1
		Female	22	48,9
2	Age	Late adolescence (17-25 years)	11	24,4
		Adults (26-45 years)	18	40,0
		Elderly (46-65 years)	16	35,6
3	Education	Elementary School	5	11,1
		Junior High School	3	6,7
		Senior High School	34	75,6
		Associate Degree	1	2,2

No	Variable	Category	Frequency, n=45	Percentage (%)
		Bachelor Degree	2	4,4
4	Employment status	Unemployed	27	60,0
		Employed	18	40,0
5	Monthly income	≤Minimum wage	28	62,2
		> Minimum wage	17	37,8
6	Family support	No	1	2,2
		Yes	44	97,8
7	Motivation to recover	No	0	0
		Yes	45	100,0
8	Monitoring of drug taking (PMO)	No	2	4,4
		Yes	43	95,6
9	Distance to hospital	Short distance	30	66,7
		Far away	15	33,3

Based on Table 1 of the 45 respondents from this study, it can be seen that most of the respondents were male, namely 23 respondents (51.1%). In line with Naga's research (Kurniati *et al*., 2023) showed that the majority of research subjects were male due to smoking and consumption of alcohol, which can reduce immunity.

The most age found in the research subjects was in the adult age group (26-35 years) with a percentage of about 26.7%, this is in accordance with the demographic data of TB in Indonesia, which describes that most age is in productive age. This data is also consistent with the annual TB report in 2022 (Rondonuwu *et al*., 2022).

The large number of TB patients found in the productive age group is due to the fact that the productive age group of 15-54 years is more susceptible to TB infection due to the higher mobility of the productive age group, thus providing opportunities for possible contact with other people who are exposed or at risk of TB (Rondonuwu *et al*., 2022).

The characteristics of respondents based on their most recent education were mostly high school as many as 34 respondents (75.6%). In line with research (Noerfitra & Surya, 2022), pulmonary TB disease occurred mostly in subjects whose highest education was high school, namely 70.4%. Education describes a person's behavior in terms of health, the lower the education, the less knowledge in the health sector both directly and indirectly can affect the physical, biological and social environment that is detrimental to health and ultimately affect the high number of existing TB cases and the regularity of taking medication (Noerfitra & Surya, 2022).

Meanwhile, the majority of people with tuberculosis are someone who does not work as many as 27 respondents (60%), while those who work are 18 respondents (40%). In line with Siregar's research in (Widiati & Majdi, 2021) the results showed that the majority of respondents were not working. If the respondent does not work, it will affect the use of health services, a person's job will also be able to reflect the amount of information received, this information will influence a person in making decisions to take advantage of existing health services, providing nutritious food, a healthy home environment and maintaining health status. This can affect physical, mental and social needs so that if these needs are not met, it can reduce the health status where the immune system decreases, making it susceptible to pulmonary TB disease (Siregar, 2015).

Monthly income is less than the minimum wage as much as 62.2%, while monthly income is more than the minimum wage as much as 37.8%. According to Helda (Siregar, 2015), family heads who have income below the minimum wage will consume food with nutritional value that does not meet the needs of each family member, so they have poor nutritional status, which makes it easier to get infectious diseases, including pulmonary TB.

Conducted by researchers, the results of motivation to want to recover were 45 respondents 100%. In accordance with the research conducted by (Elisia *et al*., 2024), with the encouragement from within the patient himself, the desire to seek treatment or control himself toward something better.

Based on Table 1, the supervisor of swallowing drugs dominates as much as 95.6%; with the PMO (monitoring of drug taking), the patient can take medication regularly until the end of treatment and seek treatment regularly so that the treatment program is well implemented (Siti Lestari & Chairil Hana Mustofa, 2016).

The distribution of distance to Hospital is close (<5KM) as much as 66.7%. According to research Salam (Salam & Wahyono, 2020), it is stated that the distance between pulmonary patients and the place of treatment should be close in the range of 3 to 5KM.

Adherence of Tuberculosis Patients

Table 2: Data on Adherence Level of Tuberculosis Patients

Level of Adherence	Frequency, n=45	Percentage (%)
High Adherence	43	95,6
Moderate Adherence	2	4,4
Low Adherence	0	0
Total	45	100,0

Based on Table 2 it can be seen that most respondents have a high level of adherence as many as 43 respondents (95.6%) and moderate adherence as many as 2 respondents (4.4%). The results of this study are supported by research (Agung *et al*., 2022) that the level of pulmonary TB treatment shows that 64 (89%) have high adherence. Adherence with drug use is very necessary to achieve therapeutic success, especially in infectious diseases. In pulmonary TB patients, adherence is very influential on the success of therapy (Agung *et al*., 2022).

Effectiveness of Tuberculosis Treatment

Table 3: Data on the Effectiveness of Tuberculosis Treatment

Effectiveness of Tuberculosis Treatment	Frequency, n=45	Percentage (%)
Effective	45	100
Not effective	0	0
Total	45	100

Table 3 shows that the effectiveness of TB treatment is 100%. The effectiveness of TB treatment was cured in 43 patients (97.8%) and complete treatment in 1 patient (2.2%). In line with Safari's research, the effectiveness of OAT use in patients consists of two treatment outcomes, namely cured and complete, patients with cured treatment outcomes 62% and patients with complete treatment outcomes 38% (Safari *et al*., 2019). Sputum microscopy for acid-resistant bacilli (BTA) is used to diagnose TB and evaluate the effectiveness of anti-TB drugs in TB eradication programs (Putra *et al*., 2019). TB treatment is considered effective if the sputum test results change from positive at baseline to negative after 6 months of treatment. All patients received standard doses of anti-TB drugs in daily fixed-dose combination (FDC) regimens recommended by the WHO, which have been shown to be highly effective in preventing and treating TB (Motappa *et al*., 2022).

Correlation between patient characteristics and TB treatment adherence

Based on the results of the data analysis, there is no difference in each group of patient characteristics in terms of gender on treatment adherence, with the significance value obtained, namely p = 0.157. This study is similar to Tesfahuneygn (Bakhtiar *et al*., 2021) in that statistically, there is no difference in gender characteristics on the level of adherence, but based on the percentage of adherence rates, it can be seen that the female gender group has more treatment adherence than the male group.

The results of the analysis of the relationship between characteristics based on age and adherence there is no difference with a significance value of P= 0.709. This is in line with the research of Bakhtiar *et al*., (2021) that age does not have a statistical difference related to medication adherence. Still, based on a percentage scale, there is an increase in non-adherence with increasing age, and the level of adherence decreases with increasing age because the older the memory decreases.

Based on the results of the analysis of this study in the education level group on anti-tuberculosis treatment adherence, there was no significant relationship, with a significance value of p=0.168. From the results of the analysis, it was found that p = 0.768, which stated that there was no relationship between the characteristics of employment status and adherence to the use of antituberculosis drugs. Statistically, there was no difference, but based on the percentage, the subjects in the non-working group tended to be more compliant compared to the working group. Kulkarni *et al*.,'s research (Bakhtiar *et al*., 2021) is also similar, explaining that unemployed patients are more adherent to treatment, perhaps because they have more time to go to health services for check-ups and take drugs at the right time. Herrero's research (Bakhtiar *et al*., 2021) also explains that workers have difficulty leaving their jobs to visit health centers.

Based on the analysis and the results obtained p=0.715, which states that there is no relationship between the characteristics of the monthly income category of tuberculosis patients with adherence to the use of antituberculosis drugs. The results of the analysis of the relationship between family support and adherence show there is no significant relationship (sig>0.05) between family support and adherence to TB drugs. Analysis of the relationship between motivation

to want to recover and adherence is described: NA (Not applicable)

The results of motivation to want to recover were 43 (95.6) respondents with a high level of adherence and the remaining 2 (4.4) respondents with moderate adherence. In accordance with research conducted by (Elisia *et al*., 2024) with the encouragement from within the patient himself, the desire to seek treatment or control himself towards better things.

The analysis of the relationship between supervisors swallowing medication and adherence based on the analysis and the results obtained p=0.755, which states that there is no relationship between the characteristics of the category of supervisors taking medication with adherence with the use of antituberculosis drugs.

Analysis of the relationship between the distance from the home to the hospital and adherence. The results obtained p=0.306, which states that there is no relationship between the characteristics of the category of distance from the home of tuberculosis patients to the hospital with adherence with the use of antituberculosis drugs.

Analysis of Adherence with Effectiveness of TB Treatment

Table 4: Analysis of Adherence with Effectiveness of TB Treatment.

Level of Adherence	Effectiveness of TB Treatment				Total		P value
	Recover		Complete Treatment				
	n	%	n	%	n	%	
High	43	95,6	1	2,2	44	97,8	0,000
Moderate	1	2,2	0	0	1	2,2	
Total	44	97,8	1	2,2	45	100	

Based on the output that appears in the chi-square analysis in Table 4, there is a significant relationship between adherence to the use of antituberculosis drugs and the effectiveness of TB treatment. This is indicated by the p-value = 0.000 (sig < 0.05), so H0 is rejected and H1 is accepted. Judging from the analysis of the results of the study, the level of high adherence with the effectiveness of cured TB treatment is 95.6%, the level of high adherence with the effectiveness of complete TB treatment is 2.2%, and the level of moderate adherence with the effectiveness of cured TB treatment is 2.2%. Adherence with the use of TB drugs will have an impact on the effectiveness of the use of antituberculosis drugs. In accordance with the treatment results of tuberculosis cases in 2022 based on the cohort of tuberculosis cases found in 2021. The TB treatment success rate in 2021 was 86% (target 90%) (Rondonuwu *et al*., 2022).

CONCLUSION

Based on data analysis and discussion of research results related to the analysis of adherence and effectiveness of TB treatment among TB patients at a Hospital in Majalengka, it can be concluded that a total of 95.6% of patients have a high level of treatment adherence and 4.4% of patients have moderate adherence. In this study, the effectiveness of TB treatment with cured status was 97.8% and complete treatment was 2.2%. In the analysis of the relationship between patient characteristics (gender, age, last education, employment status, monthly income, family support, motivation to recover, PMO (Monitoring of Drug Taking), and distance to the hospital with adherence with TB drug use. All nine characteristics did not show a significant relationship with the level of adherence to drug use.

Declaration of Competing Interest: The authors declare no competing interests.

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