The Correlation Between Medication Adherence and Role of Medication Supervisor with Prevalence of Pulmonary TB Recurrence in Serang City, Banten

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ARTICLE INFO	ABSTRACT
	Introduction: Pulmonary tuberculosis (TB) is one of the deadliest diseases and is still a major health problem in the world. The standard treatment for pulmonary TB is within 6 months. Failure of pulmonary TB sufferers to seek treatment and good adherence to medication consumption plays an important role in the recurrence of pulmonary TB. Treatment supervision (PMO) in pulmonary TB patients contributes to patient compliance in taking medication, so it can be concluded that PMO is also important in the recurrence of pulmonary TB. **Objective:** This study aims to determine the relationship between medication adherence and the role of medication supervisors with the prevalence of pulmonary TB recurrence in the city of Serang, Banten, so that it can be developed as an effort to prevent an increase in TB prevalence in the future. **Methods:** This research was conducted at the Unyur, Banten Girang, and Singandaru Health Centers in January-May 2023 with a total sample of 41 people. The research design used was a case-control design and used a total sampling technique. The analysis used was univariate and bivariate analysis using the Chi-square test and if cells did not meet the Chi-square test requirements, the alternative test was Fisher's exact **Results:** The results of this study concluded that there was no significant relationship between adherence to taking medication and monitoring taking medication with recurrence of pulmonary TB, namely obtaining p value = 0.906 and in the role of supervisor taking medication obtained p value = 0,719. **Conclusions:** Based on the results, the conclusion of this research is that there is no significant relationship between the level of treatment compliance and lung disease. recurrence of TB. Apart from that, there was no significant relationship between the role of monitoring medication taking and recurrence of pulmonary TB.

Introduction

Pulmonary tuberculosis (TB), an infectious disease caused by the bacterium Mycobacterium tuberculosis which attacks the respiratory tract, is one of the top deadly diseases and is still a major health problem in the world. The World Health Organization (WHO) in its 2021 Global TB Report reported that Indonesia was ranked second in the burden of pulmonary TB disease which accounts for more than two-thirds of the total incidence of pulmonary TB in the world (WHO, 2022; MacNeil, et al., 2020). According to the results of the 2018 Basic Health Research (RISKESDAS), Banten has a pulmonary TB prevalence of 0.76% with the second highest prevalence percentage after Papua (0.77%). Meanwhile, Serang City is ranked third in terms of the highest prevalence of pulmonary TB cases (0.71) after Tangerang (0.90) and South Tangerang City (0.72) (Kemenkes, 2022).

The high number of pulmonary TB cases is influenced by many factors. Among them are social factors, environment, behaviour and nutritional status (Shukla, Pandey, Singh, & Sharma, 2019). The behavior of people who live in densely populated environments and poor nutritional status contribute to the transmission process and play a major role in increasing the number of TB cases. If an individual experiences pulmonary TB, they must be treated immediately with standard pulmonary TB treatment, namely treatment within 6 months. (Loscalzo, 2016) If pulmonary TB patients neglect to take medication, the pulmonary TB disease agent becomes more resistant, developing and increases in number and has the potential to attack other organs. (Sudoyo, 2014; Lestari, 2019)

The proportion of pulmonary TB sufferers who do not regularly take medication in Indonesia based on RISKESDAS 2018 is 30.8% with the following most common reasons: (1) feel healthy (37.51%), (2) do not routinely seek treatment (28.42%), (3) cannot tolerate side effects (15.66). Meanwhile, the proportion of pulmonary TB sufferers who do not regularly take medication in Banten Province is 41.7% for various reasons such as: (1) do not routinely seek treatment (57.98%), (2) feel healthy (39.8%), (3) cannot tolerate side effects (36.75%) (Indonesian Ministry of Health, 2022). This data shows a high percentage of patients who do not seek treatment regularly and indicates low compliance with pulmonary TB treatment procedures in taking medication regularly to recover from their pulmonary TB disease and break the chain of transmission of pulmonary TB in Banten province. Even in conditions of this high number, the public's sense of concern and vigilance regarding compliance with taking medication in pulmonary TB patients is

low, thereby increasing the difficulty in handling cases of recurrence. (Nurhaini et al, 2022)

The failure of pulmonary TB patients to receive treatment and adhere to proper and correct medication consumption plays an important role in the recurrence of pulmonary TB and the risk of developing RR/MDR TB. The absence of medication-taking supervisors (PMO), whether from family, cadres, community leaders or Puskesmas officers who should ensure patient compliance in taking medication according to the dosage and schedule, also influences non-compliance with taking medication in pulmonary TB patients (Ministry of Health of the Republic of Indonesia, 2019). Meanwhile, the recurrence rate for pulmonary TB patients in Indonesia was recorded at 5,082 cases with Rifampicin Resistant/Multi-Drug TB (RR/MDR TB) confirmed at 8,268 cases (TBC Indonesia, 2022).

Unyur Community Health Center, Walantaka Community Health Center, and Banten Girang Community Health Center, Serang City, Banten have the situation, area coverage, and geographical location of these Community Health Centers in Serang as the capital of Banten Province, being community health centers with strategic working areas chosen as the location for this research which aims to determine the relationship Compliance with taking

medication and the role of supervisors taking medication with the prevalence of pulmonary TB recurrence so that this research can be developed as an effort to prevent pulmonary TB recurrence in the future. (Dinkes Banten, 2022)

This study aims to analyze the relationship between the level of medication adherence and the role of medication-taking supervisors with the prevalence of pulmonary TB recurrence in Serang City in 2022. To achieve this goal, it is necessary to know the distribution of the level of medication-taking compliance and patient recurrence, the distribution of the level of the role of medication-taking supervisors and recurrence. patients, prevalence of patient recurrence, analysis of the relationship between the level of adherence to taking medication and the relationship between the role of the supervisor taking medication with the prevalence of recurrence in pulmonary TB patients in Serang City in 2022.

Methods

This research uses a descriptive-analytic correlation research method with a case-control aims to reveal the correlative relationship between 2 variables (independent and dependent) retrospectively. The research was carried out on pulmonary TB patients who experienced a recurrence for the case group

and pulmonary TB patients who did not experience a recurrence for the control group at the Unyur, Banten Girang, and Singandaru Community Health Centers in January-May 2023. The sampling technique in this study was total sampling with a large The research sample was 41 respondents.

The sample selection criteria in this study included selection of case and control samples. The case samples in this study were pulmonary TB patients who had been declared cured but had experienced a relapse and were seeking treatment at the Unyur Community Health Center, Banten Girang during the 2022 period. Meanwhile, the control sample was patients who had been declared cured and had not experienced a recurrence who were seeking treatment at the Unyur Community Health Center, Banten Girang, and Singandaru over a period of time similar to the case population when declared cured. Both groups must meet the inclusion and exclusion criteria.

Inclusion criteria are pulmonary TB sufferers who are able to communicate well, are cooperative and willing to be respondents. Exclusion criteria include: If the sufferer's family does not agree with the sufferer being a research respondent, pulmonary TB sufferers with comorbidities, namely HIV/AIDS, those who have moved address and received treatment outside the working area of the Unyur, Banten Girang

and Singandaru Community Health Centers, also pulmonary TB sufferers who have died.

Material

The instrument used in this research was the MMAS (Morisky Medication Adherence Scale) questionnaire.

Statistical analysis

The analysis used was univariate and bivariate analysis using the Chi-square test and if cells did not meet the Chi-square test requirements, the alternative test was Fisher's exact. A value of $P < 0.05$ was considered significant.

Result

The research was carried out on April 1-30th 2023 on relapsed and recovered pulmonary TB patients who underwent treatment at the Unyur, Banten Girang and Singandaru Community Health Centers with a research sample of 46 respondents who were included in the inclusion criteria, namely 41 respondents. There were 5 respondents who were included in the exclusion criteria on the grounds that 1 respondent had died, 2 respondents had addresses not found, and 2 respondents had moved house out of town. Of the 41 respondents, there were 21 case group respondents and 20 control group respondents. Data collected included the level of adherence to taking medication and the role of supervisor of medication taking

(independent variable) with recurrence of pulmonary TB (dependent variable). The research results are explained as follows.

Table 1. Frequency distribution of respondents' characteristics in Puskesmas Unyur, Banten Girang, and Singandaru

Respondent characteristic	Control		Cases	
	n	%	n	%
Gender				
Male	12	60%	19	90,5%
Female	8	40%	2	9,5%
Age				
Elderly (>60 years old)	7	35%	8	38,1%
Adult (<60 years old)	13	65%	13	61,9%
Education				
No school	2	10%	1	4,8%
Elementary	11	55%	6	28,6%
Primary high school	5	25%	13	61,9%
Secondary high school	2	10%	1	4,8%
Public Health Center				
Puskesmas Unyur	0	0%	4	9,7%
Puskesmas Banten Girang	15	36,5%	5	12,1%
Puskesmas Singandaru	0	0%	20	48,7%

Based on table 1, it could be seen that from the 41 respondents, 12 (60%) respondents from the control group and 19 (90.5%) respondents from the case group were male. A total of 13 respondents from the control group (65%) and the case group (61.9%) were in the adult category. In the control group, 11 (55%) respondents had education up to primary education, while in the case group 13 (61.9%) respondents had education up to secondary education.

Table 2. The frequency distribution of respondents was based on medication adherence and the role of drug taking supervisors with pulmonary TB recurrence at Unyur, Banten Girang, and Singandaru Health Centers

Variable	Control		Cases	
	n	%	n	%
Obedience				
Bad	8	40%	7	33,3%
Good	12	60%	14	66,7%
Medicine Supervisor (PMO)				
Bad	5	25%	4	19%
Good	15	75%	17	81%
Total	20	100%	21	100%

Based on table 2, 12 (60%) respondents in the control group and 14 (66.7%) respondents in the case group adhered to taking medication. There were 15 (75%) respondents from the control group and 17 (81%) respondents from the case group who had good medication monitoring.

Table 3. The relationship between respondents' medication adherence and lung TB recurrence at Unyur, Banten Girang, and Singandaru Health Centers

Obedience	Pulmonary TB Relapse				Total		OR 95% CI value
	Control (Not relapse)		Cases Relapse				
	n	%	n	%	n	%	
Bad	8	53,3%	7	46,7%	15	100%	0,13
Good	2	46,1%	14	53,9%	16	100%	(0,37)

Based on table 3, it can be found that 8 (53.3%) respondents who did not comply with taking medication did not experience a relapse. There were 14 respondents who adhered to taking medication and experienced a recurrence of pulmonary TB. The results of the chi-square statistical test in the table above where the cell has an expected value of less than 5, a maximum of 20% shows a p value = 0.906 p$\geqslant$0.05, so H0 is accepted, meaning there is no significant relationship between compliance and recurrence of pulmonary TB.

Table 4. The relationship between the role of supervisors taking respondents' medication with lung TB recurrence at Unyur Health Center, Banten Girang, Singandaru

Obedience	Control (Not relapse)		Cases Relapse		Total		OR 95% CI value
	n	%	n	%	n	%	
Bad	5	55,5%	4	44,5%	9	100%	0,17
Good	5	46,8%	17	53,2%	22	100%	(0,32)

Based on table 4, it was found that 5 respondents (55.5%) who had poor supervision of taking medication did not experience a relapse. Meanwhile, 17 respondents (53.2%) who had good medication monitoring experienced a recurrence of pulmonary TB. The results of the Fisher's Exact statistical test because the Chi-square test requirements were not met, the table above showed a p value = 0.719 or p⩾0.05, so H0 was accepted, meaning there was no significant relationship between the role of supervisory medication taking and recurrence of pulmonary TB.

Discussion

Based on the research results, the characteristics of the respondents obtained were gender, age, education, and work area of the health center. Regarding gender, the respondents were mainly male. The high incidence of recurrence in men is due to fact that most men have activity patterns outside the home and smoking habits are related to the incidence of pulmonary tuberculosis, while high activity outside the home can cause higher transmission of germs. The age characteristics of the respondents are dominated by adults rather than the elderly. This can happen because in the adult age group, which is the productive age, each individu will tend to have high activity, so that the transmission of germs is greater. In addition, andogenic reactivity (bacilli that are already in the body become active again) tends to occur during productive age.

In terms of education, there were 13 respondents who had secondary education. Education plays a role in sufferers' ability to receive information about disease, especially pulmonary TB. A low level of education will result in a low level of knowledge in terms of maintaining personal and environmental hygiene (Trasia et al, 2014)

The working areas of the community health centers in this study include the Unyur, Banten Girang, and Singandaru Community Health Centers. Unyur Community Health Center was chosen as the research location because it had the highest rate of smear positive pulmonary

TB in Serang District, Serang City in 2021. Meanwhile, the Banten Girang and Singandaru Community Health Centers were selected as research locations to meet the minimum sample for this study because they had patients with the required respondent criteria. The frequency distribution of respondents based on the variables they want to study, namely medication adherence and medication monitoring, is presented in univariate analysis.(Afriani, 2021)

In the analysis of medication adherence, there were 14 respondents who adhered to taking medication but experienced a relapse. Patients with a high level of compliance but still experiencing relapses can occur because the patient has a wrong perception about the rules for taking medication, where the sufferer considers himself to be obedient to taking medication by taking medication according to the medication schedule but not according to the time or hours that have been determined. Patients who were non-compliant and did not experience recurrence were 8 respondents (53.3%) with research observations that this could be influenced by the patient's nutritional status and the patient's immunity. Observation results show that 50% of respondents who were non-compliant were caused by several things, namely the respondents' low knowledge of the importance of compliance

with taking medication, boredom with the duration of treatment, and the patient's lack of awareness in remembering when to take medication so that treatment had to be repeated. (Asriani, 2018)

The results of this research are in line with research conducted by Yohana et al (2019) regarding the factors causing recurrence of tuberculosis cases in the Palangka Raya City Health Center with 30 respondents. Cross-sectional data obtained from statistical tests using chi-square, namely a p value of 0.283 p$\geqslant$0 .05 so there is no relationship between history of taking medication and recurrence of pulmonary TB in Palangkaraya City. Palangkaraya City in Central Kalimantan Province has a complete treatment rate for tuberculosis at 63.8%, whereas Banten Province is at 74.1%. This condition allows for similar research results. (Azizah, 2020)

This research proves that patients who are compliant and patients who are not compliant with taking OAT both have the same chance of experiencing a relapse of pulmonary TB. Patients who are not adherent to taking medication have the opportunity to experience a relapse because non-compliance in taking medication creates problems with the organism's resistance to the drug and can then experience reactivation into cases of pulmonary TB relapse. In patients who adhere to taking OAT, the patient still has a

chance of experiencing a recurrence of pulmonary TB which is caused by several things such as reinfection (recurrent infection) due to a weakened overall immune system due to poor nutritional status or decreased respiratory tract immunity due to exposure to cigarette smoke or the presence of comorbidities that increase the risk of reinfection with *Mycobacterium tuberculosis* bacteria. (Bagaskoro, 2016)

In the analysis of the role of medication-taking supervisors, there were 17 respondents who had good medication-taking supervisors and experienced relapse. Respondents with PMO who did not play a good role but did not experience a recurrence were 5 respondents (55.5%), the results of observations obtained in the study showed that the patient's motivation and hope to recover was so great, so that the patient continued to carry out treatment well even without assistance. by PMO. Meanwhile, respondents with a good PMO role but still experiencing relapse may occur because of the boredom experienced by the patient because of the many and long treatments so they neglect treatment without the PMO's knowledge, but the patient still takes treatment at the health center because motivated by supervisors to take their medication. (Goldie, 2018)

Research conducted by Atikah et al (2020) on the relationship between adherence to taking medication and the incidence of relapse of tuberculosis in children at Al-Ihsan Regional Hospital, Bandung, where data obtained from statistical tests using Exact Fisher obtained p value=1,000 (p$\geqslant$0.05) which This means that there is no relationship between supervision of taking medication and TB recurrence because most respondents have quite good supervision of taking medication. This research was carried out using a case-control method with a retrospective approach in accordance with this research. Apart from that, Bandung in West Java Province has quite high availability of PMO, namely at 69.9% with a pulmonary TB prevalence of 0.63% while Banten is at 54.1% with a pulmonary TB prevalence of 0.76%. This assumes that the high availability of PMO is not related to the incidence of pulmonary TB relapse cases.(Gordon et al, 2018)

The results of this research are in line with research conducted by Marini et al (2021) regarding the relationship between knowledge, attitude and behavior of PMOs on the incidence of recurrent tuberculosis in Muara Enim Regency, where statistical test data were obtained using the Chi-square test with a p value of 0.574 (p $\leq$0.05) then there is no relationship between knowledge, attitudes and behavior of supervisors taking medication and recurrence of pulmonary TB. This research by Marini also used a

case-control design and a retrospective approach similar to the research carried out here. Muara Enim District in South Sumatra Province also has a high availability of PMO at 77.7%, however with 138 research samples that have been studied, knowledge, attitude and behavior of PMO are not significantly related to pulmonary TB recurrence. (Keliat et al, 2018)

The limitation of this study is that it has not involved smoking status, nutritional status, including weight of respondents and their level of some vitamins as vitamins D. Prescription of the immunomodulators next to drugs might help in prevention the relapse. In addition to education history also working status should be considerred. Respondents who have good medication-taking supervisors experience a relapse and vice versa are still unknown, but lead to alleged antibiotic resistance. The level of knowledge to transmission, symptoms, risk factors and preventive behavior needs to be explored more in further studies.

Conclusion

Based on the results of the research and discussion regarding the relationship between adherence to taking medication and the role of supervisors taking medication with the prevalence of recurrence of pulmonary TB in Serang City, Banten, it can be concluded that the distribution of levels of adherence to taking

medication and recurrence of pulmonary TB patients is 7 respondents who are non-compliant and 14 respondents who are compliant with taking medication suffers from relapse. It is known that the distribution of the level of the role of medication taking supervisor (PMO) and recurrence of pulmonary TB is that 4 respondents with a poor PMO role and 17 respondents with a good PMO role experienced a recurrence. The incidence of relapsed and cured pulmonary TB was 41 patients with 21 relapses and 20 cured patients. There is no significant relationship between the level of adherence to taking medication and recurrence of pulmonary TB in Serang City, Banten. There is no significant relationship between the role of medication taking supervisor and recurrence of pulmonary TB in Serang City, Banten.

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