

Correlation between Chest X-Rays and TCM (Rapid Molecular Tests) in Pulmonary Tuberculosis Patients at Anutapura Hospital Palu

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ABSTRACT

Tuberculosis (TB) is an infectious disease that can cause a decline in health, caused by *Mycobacterium tuberculosis*. The Molecular Rapid Test with Xpert MTB/RIF is a test tool using a cartridge based on the Nucleic Acid Amplification Test (NAAT) to identify *Mycobacterium tuberculosis* and resistance to rifapicin. Radiology plays an important role in diagnosis and evaluation of TB cases. Thoracic X-ray is required if the patient with a negative Molecular Rapid Test result but has strong clinical manifestations. Method: This research is an observational analytic study with a cross sectional approach. The sampling technique used is total sampling also using secondary data. The amount of sample is 154 patients. The statistical test used is the Spearman test and the Lambda. Contingency Coefficient test. Result: The results showed, there is 15 (9,7%) in MTB not detection, 58 patients (37,7%) in MTB detected low, 62 (40,3%) in MTB detected medium, and 19 (12,3%) MTB detected high. Minimal lesion is 14 (9,1%) and advanced lesion 140 (90,9%). Typical lesion location 142 (92,2%) and atypical location 12 (7,8%). There is a significant relationship between the area of the lesion on the chest radiograph and the Molecular Rapid Test examination with a p value of 0.000 (p value < 0.05) and a correlation coefficient value of $r = 0.527$, and there is no significant relationship between the location of the lesion on a chest X-ray with a Rapid Molecular Test examination with a p value of 0.615. Conclusion: There is a significant and strong relationship between lesion area in chest x-ray and Molecular Rapid Test results. And there is no relationship between the location of the lesion on the chest X-ray with Molecular Rapid Test results.

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1. INTRODUCTION

Tuberculosis (TB) is an infectious disease that can cause a decrease in health, and one of the top 10 causes of death in the world, is caused by *Mycobacterium tuberculosis*. The World Health Organization (WHO) estimates that a quarter of the world's population has been infected with *Mycobacterium tuberculosis*. Globally, there were 10 million (8.9 -10 million) people fell ill with TB in 2019, with national incidence rates varying from less than 5 to more than 500 new cases, and relapse cases per 100,000 population per year. Countries contributing to two-thirds of global TB cases are India (26%), Indonesia (8.5%), China (8.4%), Philippines (6.0%), Pakistan (5.7%), Nigeria (4, 4%), Bangladesh (3.6%) and Asia Africa (3.6%)[1].

Tuberculosis (TB) in Indonesia is currently still a problem in public health, so that it becomes one of the goals of sustainable health development. In 2019, the number of tuberculosis cases reported was 543,876 cases. Provinces with a large population contributing the highest cases of tuberculosis are West Java, East Java and Central Java. Cases from the three provinces account for almost half of the total number of tuberculosis cases in Indonesia, which is 45%.[2].

Routine reporting of health facilities through SITT application (Integrated Tuberculosis Information System) application and reporting of TB case screening activities at the hospital, found TB cases in Central Sulawesi had an increase in the CDR (Case Detection Rate) case rate in 2018 by 59% to 62% in 2019. Districts that experienced a significant increase in the number of cases occurred in the Morowali Regency and Banggai Regency. In Palu City, the CDR of TB cases has decreased in 2018 by 60% to 55% in 2019. So that Tuberculosis (TB) is still a health problem in Indonesia and internationally

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which is the goal of sustainable health development (SDGs) Assessment of TB diagnosis includes history, physical examination and supporting examinations in the form of radiological and bacteriological examinations to identify Mycobacterium tuberculosis in the body. With the development of TB testing technology and taking into account the incidence of TB in Indonesia and the world, the World Health Organization (WHO) recommends using GeneExpert for individuals with TB indications. GeneExpert is considered capable of providing benefits for the early diagnosis of TB and the use of this diagnostic system can increase the certainty of a rapid diagnosis for all patients[3].

Molecular Rapid Test (TCM) with XpertMTB/RIF is a cartridge-based testing tool based on the Nucleic Acid Amplification Test (NAAT) that can quickly identify Mycobacterium tuberculosis and resistance to rifampicin. Radiological examination is needed if the patient has a negative TCM result but has strong clinical manifestations[4], [5]. Radiological examination also provides an advantage in the diagnosis of miliary TB and pediatric TB. Chest X-ray examination is a practical way to get tuberculosis lesions. The classification of the area of the lesion shown on the chest X-ray is minimal, moderate advanced, and for advanced[6], [7].

2. METHODS

This research is an observational analytic study using a cross sectional approach. The population in this study were all pulmonary TB patients who were recorded at Anutapura Hospital in Palu from January to December 2020. Sampling was carried out using a total sampling technique. The number of samples in this study were 154 people. The data used in this study is secondary data with research instruments, namely medical records.

Processing of this data is done in a way editing, coding, entry, And tabulating and perform analysis using SPSS. Bivariate analysis using the correlation test spearman and lambda contingency coefficient correlation test.

3. RESULTS AND DISCUSSION

Based on data on 395 pulmonary TB patients obtained from the Anutapura General Hospital in Palu in 2020, 154 samples were obtained that met the inclusion criteria.

Table 1 shows the results of radiology examination of thoracic photographs. Based on the extent of the lesion, the majority were found in the extensive lesion category, namely 140 people (90.9%), for the minimal lesion category as many as 14 people (9.1%). As for the location of the lesion, 142 people (92.2%) were found with typical lesions and 12 people (7.8%) with atypical lesions.

Table 1. Frequency distribution based on the area and location of the lesion on chest radiographs of pulmonary tuberculosis patients

Thorax's photo	Category	Frequency	%
Lesion Size	Wide	140	90,9
	At a minimum	14	9,1
	Total	154	100
Lesion Location	Typical	142	92,2
	atypical	12	7,8
	Total	154	100

(Source; secondary data, 2020)

In the results of the Molecular Rapid Test (TCM) examination in this study, there were 15 people (9.7%) with undetectable MTB results, 58 people (37.7%) with Detected Low MTB, 62 people (40.3%) with MTB Detected Medium results, and as many as 19 people (12.3%) with MTB Detected High results (table 2).

Table 2. Frequency Distribution based on Molecular Rapid Test Results

Molecular Rapid Test	Frequency	%
mtb not detected	15	9,7
mtb detected low	58	37,7

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mtb detected medium	62	40,3
mtb detected high	19	12,3
Total	154	100

(Source; secondary data, 2020)

The results of the data analysis in table 3 show the relationship between the area of the lesion on the chest X-ray and the results of the Molecular Rapid Test (TCM), a significant value of 0.000 was obtained. Because the p -value < 0.05 , H_0 is rejected, meaning that there is a significant relationship between the size of the lesion and the results of the Molecular Rapid Test (TCM), with a correlation coefficient of $r = 0.527$, meaning that the strength of the relationship is strong.

Table 3. Relationship between the area of the lesion on the chest X-ray and the results of the Rapid Molecular Test (TCM)

Lesion area	Molecular Rapid Test								Total	Percentages	r	p -value
	MTB NOT DET		MTB DET LOW		MTB DET MED		MTB DET HIGH					
	F	%	F	%	F	%	F	%				
Minimuml	14	100	0	0.0	0	0.0	0	0.0	14	100	0.527	0.000
Lsteam	1	0.7	58	41,4	62	44,3	19	13,6	140	100		
Total	15	9,7	58	37,7	62	40,3	19	12,3	154	100		

(Source; secondary data, 2020)

Table 4. Relationship between the location of the lesion on the chest X-ray and the results of the Rapid Molecular Test (TCM)

Lesion area	Molecular Rapid Test								Total	Percentages	p -value
	MTB NOT DET		MTB DET LOW		MTB DET MED		MTB DET HIGH				
	F	%	F	%	F	%	F	%			
Typical	15	10.06	53	37,3	56	39,4	18	12,7	142	100	0.615
atypical	0	0	5	41.7	6	50	1	8,3	12	100	
Total	15	9,7	58	37,7	62	40,3	19	12,3	154	100	

(Source; secondary data, 2020)

Based on table 4 above, shows the results of the analysis of the relationship between the location of the lesion on the chest photo and the Molecular Rapid Test (TCM) examination, the p -value = 0.615, which can be concluded that there is no relationship between the location of the lesion on the chest photo and the results of the TCM examination.

DISCUSSION

Research with a cross-sectional design was carried out at Anutapura General Hospital, Palu, which was held from October to November 2021. The research was carried out by collecting secondary data in the form of medical record data, laboratory results, and radiological examination results of tuberculosis patients at Anutapura General Hospital, Palu, for the 2020 period. Out of 396 patients, obtained a total sample of 154 people who met the inclusion and exclusion criteria.

The measuring scale for assessing and interpretation is shown in the operational definition table. The number of samples in this study were 154 patients who met the inclusion criteria and were included in the data to be analyzed, then data processing was carried out using the Statistical Package for Social Sciences (SPSS) program, so that data could be identified in the form of sample characteristics based on gender, age, clinical symptoms, and the relationship between chest x-ray examination and the results of molecular rapid tests. Then, the data is presented in tabular form to make it easier for the reader to understand.

Based on data obtained from the World Health Organization in 2020 more than 56% of patients who contributed to tuberculosis cases were patients in the adult category.

The diagnosis of TB can be made based on clinical symptoms, physical examination, laboratory examination, radiology examination, and supporting examinations such as molecular rapid tests.

This study uses variables from the results of a molecular rapid test which is a new method for diagnosing tuberculosis quickly based on molecular examination using the Real Time Polymerase Chain Reaction (RT-PCR) method with the target gene *rpoB* in the bacterium *Mycobacterium tuberculosis*. The prime PCR used was able to amplify the core of the *Mycobacterium tuberculosis rpoB* gene and mutations in the core region associated with resistance to rifampicin.

World Health Organization since in 2010 has suggested the use of molecular rapid tests as an initial diagnostic test in patients with suspected tuberculosis and pulmonary tuberculosis patients with suspected rifampicin resistance. The advantages of the molecular rapid test examination are that it does not require a lot of human resources and can provide an accurate diagnosis of tuberculosis as well as detect rifampicin resistance in just a short time compared to the previous examination, namely the AFB sputum examination.[8].

Based on the results of the GeneXpert molecular rapid test, in this study the MTb Detection Medium results were obtained in 62 patients (40.3%) of a total of 154 patients. This result is the most commonly found in the results of molecular rapid test examinations. These results are in accordance with previous research conducted by Fachri, et al in 2021, the study found that 88.9% of the most patients were patients with MTb Detection Medium results[9].

Thoracic photography is a fast imaging technique and one of the main tools in diagnosing tuberculosis disease. The results of the study on the image of thoracic photographs in the form of lesion area, the most common area found was lesions with a large category of 140 patients (90.9%) compared to the results of lesions in the minimal lesion category of 14 patients (9.1%). This result is similar to the research of Layali, et al (2019), which states that the proportion of lesions in the extensive lesion category is more than the proportion of lesions in the minimal lesion category[10].

In most patients in this study, it was found that the most common lesion location was in the typical category, namely lesions located at the lung apex, superior segment of the inferior lobe as many as 142 patients (92.2%), compared to the proportion of atypical category lesions as many as 12 patients (7.8%). This is in line with the findings of the radiological examination of the thoracic photographs of Sulaiman, et al (2018), where the most common lesion location is in the upper zone or typical lesions[11].

The results of the correlation test to determine the relationship between the results of radiological examination of chest X-rays in the form of lesion area of tuberculosis patients and the results of the Molecular Rapid Test (TCM) examination, obtained a significance value of 0.00, which means there is a relationship between the area of lesions on chest X-ray images and the results of the Rapid Test examination. Molecular, and the correlation coefficient is obtained $r = 0.527$ which indicates a strong correlation strength. This is in line with the study of Triandini, et al (2019), which stated that there was a fairly close relationship between the broad picture of the radiological lesions and the results of sputum examination of tuberculosis patients[12].

In this study, a correlation test was conducted to determine the relationship between the location of the lesion based on the results of chest X-rays of pulmonary tuberculosis patients and the TCM examination. It was found that there was no relationship between the location of the lesion on the X-ray image and the results of the TCM (Rapid Molecular Test) examination. There is no relationship between the location of the lesion on the chest X-ray and the results of the TCM (Rapid Molecular Test) obtained in this study, due to several limitations, mainly related to the possibility of poor recording and under-reporting of sample data collection.

4. CONCLUSION

The extent of the lesion on the chest x-ray picture of pulmonary tuberculosis patients is strongly related to the results of the Molecular Rapid Test (TCM). And there is no significant relationship between the location of the lesion on the chest X-ray and the results of the Molecular Rapid Test (TCM) in pulmonary tuberculosis patients.

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