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Differences in acid-resistant battery examination results ziehl neelsen method and Rapid Molecular Test (TCM) at Sekayu regional hospital in 2023

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ABSTRAC

Pulmonary tuberculosis is the most deadly infectious disease in the world, besides this disease is caused by *Mycobacterium tuberculosis* (MTB). *Ziehl Neelsen* examination and TCM (*Rapid Molecular Test*) are the methods used to detect Mycobacterium tuberculosis. The aim of this study was to determine the results of acid-resistant bacteria in pulmonary tuberculosis examination between the *Ziehl Neelsen* and TCM methods at Sekayu Regional Hospital. This type of research is quantitative analytical with a cross sectional approach by looking at the positive or negative results of patients suspected of having tuberculosis. The research method used was *Ziehl Neelsen* and TCM sputum examination methods. The results of the research from the 9 samples examined were that 6 samples were negative and 3 samples were positive in the *Ziehl Neelsen* microscopic examination method, while in the Molecular Rapid Test examination, 3 positive results were found for MTB Detected very Low and 6 (Negative) MTB Not Detected. The conclusion of this study is that there is no difference between the two methods. It is recommended that the public carry out BCG (*Bacille Calmette Guerin*) vaccination and ensure that the house has good air ventilation.

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INTRODUCTION

Tuberculosis remains one of the most deadly and infectious diseases in the world. Every day no less than 4,100 people die due to tuberculosis and nearly 28,000 people are sick with diseases that can be cured and prevented. The global initiative to fight tuberculosis has saved around 66 million lives since 2000. However, the COVID-19 pandemic has reversed several years of progress made in the fight to end tuberculosis. First time in more than one year, deaths increased in 2020 (WHO, 2022)

Indonesia is ranked second in the country with the most tuberculosis cases, namely 1,020,000 tuberculosis cases behind India. Thus, cases of tuberculosis and drug-resistant tuberculosis are still a big problem and must be resolved immediately in Indonesia and even in the

world. The largest distribution of tuberculosis is on the island of Java and West Java is at the top, Banten and Central Java are areas prone to transmission of the disease. On the other hand, outside Java Island, the area of concern is North Sumatra Province. Outside of the areas in the top five rankings that have the highest number of tuberculosis, currently there is no blood that is truly free from tuberculosis (Sahara & Adelina, 2020)

Based on the Health Service for the province of South Sumatra, the number of tuberculosis sufferers in 0202 was 16,686 cases with a population of 4,303,327 people and the highest was in the Palembang area with a total of 2,601 cases with a population of 834,175 and for cases in Musi Banyuasin Regency. In 2018, 827 cases were recorded of all patients suffering from tuberculosis (Dinkes Provinsi Sumsel, 2019).

Tuberculosis is a direct infectious disease caused by bacteria (*Mycobacterium tuberculosis*). Most of the tuberculosis bacteria attack the lungs but can also attack other body organs. Some of the common symptoms of tuberculosis are reduced appetite, continuous coughing with phlegm, and diarrhea for three weeks or more. Due to the lack of public knowledge and awareness regarding tuberculosis, some of these symptoms are common diseases and do not require further action, thus several cases of tuberculosis are increasingly occurring (Dewi & Sunarso, 2020)

Microscopic examination using the *Ziehl Neelsen* staining method is the first alternative for early detection of tuberculosis. This technique is a cheap, easy technique and has high enough specifications to detect BTA in sputum. Diagnosing pulmonary tuberculosis through the TCM microscopic method of applying sputum specimens. One of the factors that determines the success or failure of the diagnosis results using this method is the handling of the sputum specimen. Ideally, the sputum specimen needs to be handled quickly.

The diagnosis of Tuberculosis can be made through microscopic examination of BTA in the patient's sputum. BTA staining can be done using the Tan Thiam Hok, Ziehl Neelsen, or Fluorochrome methods. Based on this third method, fluorochrome has the highest sensitivity compared to the other two staining methods. However, because this method requires very expensive equipment, it is difficult to carry out in health facilities with simple facilities. Therefore, the Ziehl Neelsen staining method and the Rapid Molecular Test (TCM) are 2 methods that are quite simple and provide fairly high sensitivity and specificity.(Hermansyah, 2022)

The difference between this study and the previous one is that this study did not examine the smell, color and consistency of sputum, according to research by Hermanysah (2022) there was an influence based on volume, there was an influence based on odor, color and consistency of sputum. then in this study we did not use the molecular rapid test decontamination method as carried out by Husna (2020) that TCM has the same diagnostic ability in identifying Mycobacterium tuberculosis and both can be used according to needs, costs and laboratory facilities. The difference in research conducted by Latifah (2022) is testing the sensitivity and specificity of the microscopic method (Latifah et al., 2022)

The GeneXpert rapid molecular test is an integrated and automatic molecular examination using the *Polymerase Chain Reaction* (PCR) technique from the bacterial *deocyribonucleic acid* (DNA) test to detect MTB and detect bacterial resistance to rifampicin. TCM has a sensitivity of 96.5% for the diagnosis of tuberculosis and a sensitivity of 96.1%. Data detects rifampicin resistance. The results of diagnostic tests via TCM GeneXpert have specificity, sensitivity, negative predictive value, positive predictive value and high accuracy in smear negative pulmonary tuberculosis. There is no known comparison of the identification results of decontaminated BTA which has higher sensitivity compared to non-decontaminated BTA when compared with TCCM (Husna & Dewi, 2020)

From the background of this problem, several problems that can be identified are tuberculosis, a lung infection that can cause death, this infection is caused by mycobacterium tuberculosis and is still a world health problem. Indonesia is one of the second ranked countries with 1,020,000 tuberculosis cases below India. Thus, cases of tuberculosis and drug-resistant

tuberculosis are a big problem that needs to be resolved immediately both in Indonesia and in the world. The most tuberculosis is on the island of Java, West Java Province with the highest ranking and the highest incidence of tuberculosis in Indonesia. Tuberculosis patients can be examined using the microscopic method and the TCM method. So the aim of this research is to analyze the differences between the results of BTA and TCM microscopic examinations in the sputum of patients suspected of tuberculosis at Sekayu Regional Hospital.

RESEARCH METHOD

This research is a type of quantitative analytical research that uses a cross sectional approach by looking at the positive or negative results of patients suspected of tuberculosis. This research was conducted in June 2023. This research was carried out at the Sekayu Regional Hospital Laboratory in 2023.

The population of this study was all patients who underwent tuberculosis examinations at the Laboratory Installation of Sekayu Hospital in 2023. The sample for this study was 9 people due to limited time and number of patients, samples were taken from patients who underwent tuberculosis examinations in the Sekayu Hospital laboratory which was carried out during the research using microscopic and TCM methods at Sekayu Regional Hospital. This research uses primary data, namely the results of sputum examination of patients suspected of pulmonary tuberculosis using Microscopic and TCM methods in June 2023.

Meanwhile, secondary data is references from various journals and books used in this research. In this research, the overall picture of the results of sample examination at the Sekayu Hospital Laboratory is described. Univariate analysis was carried out to obtain an overview of the examination results of each variable studied and presented in table form which was processed using SPSS. The bivariate analysis describes the differences in examination results for acid-fast bacteria in pulmonary tuberculosis using the *Ziehl Neelsen* method and the TCM method.

The work procedure consists of several stages, starting from the Sputum Examination with the Microscopic Method (*Ziehl Neelson*), staining the preparation using the *Ziehl Neelson* method, reading the preparation, recording the reading results, and examining the sputum using the molecular rapid test method.

RESULTS AND DISCUSSIONS

General description of the research location

The location of the Sekayu Class C Regional Hospital is on Jalan Colonel Wahid Udin, Ward 1, Kayura District, Musi Banyuasin Regency. Initially, Sekayu Class C Regional Hospital only had 60 beds and facilities with types of services such as other Class C RSUs, with 4 specialist doctors, namely obstetrics and gynecology specialists, surgical specialists, internal medicine specialists and pediatric specialists. However, the reality in the field is that there are only pediatricians and internal medicine specialists, the other two specialist doctors are contract workers.

There are many financial and substantive issues currently being faced by Sekayu Hospital, namely a lack of maintenance personnel, the new building has not been completed so it needs adjustments to its maintenance and monitoring.

Research result

Figure 1. Sputum samples from patients suspected of having tuberculosis

The results of this pulmonary tuberculosis examination research were carried out from June 18 to June 26 2023 at Sekayu Regional Hospital with the aim of analyzing the results of BTA (acid-fast bacteria) examination using the molecular rapid test method and *Ziehl Neelsen*. The samples used in this study were 9 sputum samples which were examined using the TCM and *Ziehl Neelsen* methods as shown in Figure 1. The results of the frequency distribution are shown in Table 1.

Table 1. Frequency distribution of examination for acid-fast bacteria by *ziehl neelson* method and TCM in tuberculosis patients at Sekayu Hospital based on gender

No.	Gender	Frequency	Percentage %
1	Male	6	67
2	Female	3	33
	Total	9	100

Results from Frequency Distribution of Acid-Fast Bacteria Examination using the *Ziehl Neelsen* and TCM methods in Tuberculosis Patients at Sekayu Regional Hospital in June 2023. From the male gender with a total of 6 people (67%) and the female gender with a total of 3 people (33%).

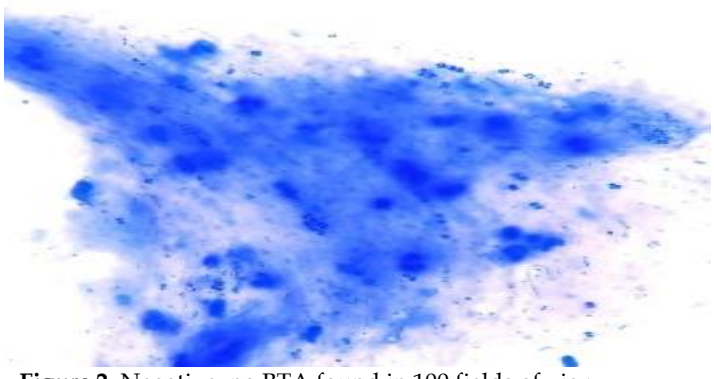

Figure 2. Negative, no BTA found in 100 fields of view

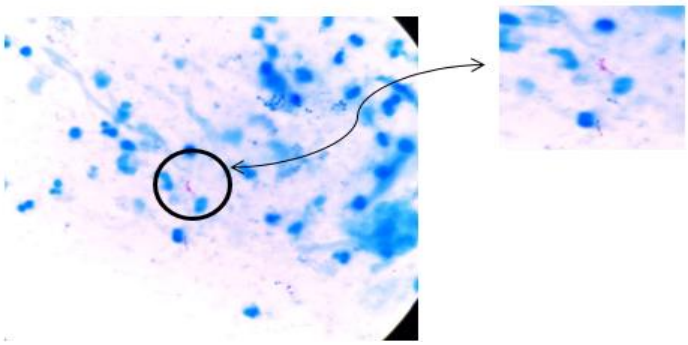

Figure 3. Scanty, 1-9 BTA found in 100 visual fields

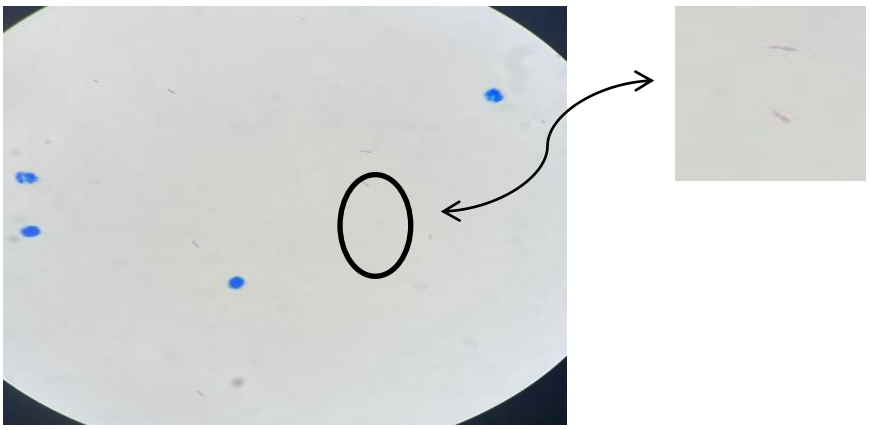

Figure 4. Positive 1 Found 10-9 BTA in 100 fields of view

The results of the microscopic examination using the *Ziehl Neelsen* method are divided into 5 parts, namely: Negative, Scanty, Positive 1, Positive 2, Positive 3. Meanwhile, the results of the Acid Fast Bacteria (BTA) examination using the Molecular Rapid Test method are divided into: MTB Not Detected, MTB Detected Rifampicin Very Low, MTB Detected Rifampicin Low, MTB Detected Rifampicin Medium, MTB Detected Rifampicin High. So the sputum samples examined using the Ziehl Neelsen method and the Rapid Molecular Test (TCM) at the Sekayu Hospital Laboratory Installation in June 2023 obtained data as in Table 2.

Table 2. Results of ziehl neelsen and TCM methods of acid-fast bacterial examination in tuberculosis patients at Sekayu Regional Hospital in June 2023.

No	*Ziehl Neelsen* result	Frequency	Percentage %	No	TCM result	Frequency	Percentage %
1	Negative	6	66.7	1	MTB Not Detected	6	66.7
2	*Scanty*	2	22.2	2	MTB Detected Rifampicin Very Low	2	22.2
3	Positive 1	1	11.1	3	MTB Detected Rifampicin Medium	1	11.1
	Total	9	100			9	100

From table 2, the results obtained using the Ziehl Neelsen method showed negative results for 6 patients (66.7%), scanty results for 2 patients (22.2%), positive results for 1 patient (11.1%). Meanwhile, the TCM method shows that out of 9 patients with suspected tuberculosis with MTB Not Detected results, 6 patients (66.7%), MTB Detected rifampicin very low were 2 patients (22.2%), MTB Detected rifampin medium was 1 patient (11.1%)

Discussion

Positive results of microscopic examination of sputum for acid-fast bacteria have high diagnostic value to support the diagnosis of clinical patients with pulmonary tuberculosis. However, negative BTA sputum microscopic examination results cannot shift the diagnosis of pulmonary tuberculosis. According to the Ministry of Health (2020), the high specificity value in examination results is the reason why BTA microscopic examination is the best method to help diagnose tuberculosis using a laboratory.

The *Ziehl-Neelson* staining method is still the main choice for early detection of tuberculosis infection through several advantages, namely that it is cheap, efficient, easy and has high specificity for detecting Acid-Fast Bacteria (AFB) in sputum and can be done in all laboratory units.

The advantage of the Rapid Molecular Test (TCM) tool is the speed in processing results. Every 45 minutes, one TCM machine can detect 4 samples simultaneously. So, if the machine works for 24 hours, every day one GeneXpert machine can carry out 96 inspections. This Medin is also quite widely available in most parts of the country. According to Aldofery (2023), TCM inspections are good so they can be expanded in the future in order to increase inspection capacity in Indonesia. Inspection capacity is the key to reopening the Indonesian economy.

Based on the data after the examination, the results of the acid-fast bacteria examination using the *Ziehl Neelsen* method and the rapid molecular test method (TCM) were obtained at the Sekayu Regional Hospital Laboratory in June 2023. From table 5.3, it can be seen that there was no difference in the results of the two methods, thus the TCM and BTA has the same diagnostic ability when identifying *Mycobacterium tuberculosis*.

This research is in line with research conducted by Hermansyah (2022) that there is no effect on volume on *Mycobacterium tuberculosis* through painting acid-resistant bacteria using the *Ziehl Nelssen* method and rapid molecular test. There is an effect on odor, color and consistency (Hermansyah, 2022). The results of the research are also in line with the conclusion that there is no statistically significant difference in the results of the two methods, so that the examination of acid-fast bacilli, the decontamination method and the molecular rapid test method have the same diagnostic ability in identifying Mycobacterium tuberculosis and both can be used according to needs, costs and laboratory facilities (Husna et al., 2020).

Another method that can be applied to detect tuberculosis bacteria is the IGRA (Interferon Gamma Release Assay) test which can be applied independently, without anyone accompanying you. The test results are obtained within 24 hours without affecting the body's response if you want to get another test. The BCG (*Bacille Calmette Guerin*) vaccine obtained does not cause negative IGRA test results. Not only that, there are also several drawbacks, for example the blood cells taken need to be processed within 24 hours. Errors when carrying out and collecting examination samples can cause the accuracy of the test to decrease. With limited data from this test, it is difficult to predict the development of tuberculosis in the future. According to NSW (2022). The IGRA test works to measure a person's immune reactivity from bacterial infections that cause tuberculosis. White blood cells from most people who have been infected with Mycobacterium tuberculosis. (Muttaqien & Cahyaningati, 2023)

CONCLUSION

Based on the results of the microscopic examination and the Molecular Rapid Test at the Sekayu Regional Hospital Laboratory Installation, it can be concluded that there is no difference in the results of the statistical tests on the two methods so that the Acid-Fast Bacteria (BTA) examination and the Molecular Rapid Test (TCM) have the same diagnostic ability in identifying Mycobacterium tuberculosis.

The limitation of the problem in this research proposal is that due to time, cost and number of sample limitations, the researcher limits the research to only differences in the results of microscopic examination and rapid molecular tests (TCM) in the sputum of patients suspected of having tuberculosis, it is hoped that future researchers will examine other variables including employment and education which can cause tuberculosis. The implication of this concept is that it is based on research that is pretty fast to use, efficient and has high specificity for detecting BTA in sputum and can be carried out in all laboratory units. Apart from that, this machine is also widely available throughout world.

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