Buletin Kedokteran & Kesehatan Prima
Vol.3 No.2 (2024)
DOI: 10.34012/bkkp.v3i2.5869

ORIGINAL ARTICLE

Radiographic evaluation of pulmonary tuberculosis: A comparative study of pre- and post-treatment chest X-rays at Royal Prima Hospital

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ABSTRACT

Pulmonary tuberculosis (TB) is a significant global health concern. Chest radiography is an essential tool for the diagnosis and monitoring of TB treatment. This retrospective cohort study aimed to analyze changes in chest radiographic findings among TB patients before and after treatment at Royal Prima Hospital. The study included 30 patients with TB who underwent repeated chest radiography between May 2023 and May 2024. Patient data were collected from the medical records. Descriptive analysis and the chi-square test were used to compare changes in radiographic findings between the treatment and non-treatment groups. Of the 30 patients, 15 (50%) showed positive changes on post-treatment radiographs, while the remaining 15 (50%) did not. The Chi-Square test revealed a significant difference ($P < 0.05$) between the two groups. Patients who received treatment had four-fold higher odds of experiencing radiographic changes than those who did not. These findings align with those of previous research demonstrating the efficacy of TB treatment in the repair of lung damage. Positive changes in post-treatment radiographs indicated that the treatment effectively suppressed *Mycobacterium tuberculosis* growth and facilitated lung tissue repair. Pulmonary TB treatment exerts a significant impact on changes in chest radiographic findings. This study underscores the importance of adequate TB treatment to achieve cure and prevent complications.

Keywords: pulmonary tuberculosis, thoracic photograph, TB treatment, retrospective cohort

Introduction

To diagnose a disease, a picture of an abnormal organ is required. Therefore, examination is required to describe the state of the organ. In 1895, X-rays were first discovered by Wilhelm Conrad Rontgen. X-rays are helpful in describing abnormalities in organs.[1] Radiology is a branch of medical science that serves to diagnose organs by using imaging technology or images.[2]

Tuberculosis (TB) is a chronic health hazard caused by bacterial infections that attack the respiratory organs of the lungs. *Mycobacterium tuberculosis* causes this disease. Patients with TB usually experience various symptoms related to the respiratory system, such as coughing, coughing up blood, and chest pain or pain during breathing. As it is one of the most dangerous diseases, public awareness and understanding of this disease are very important. In 2019, 10 million people worldwide were infected with tuberculosis 2019 and 1.4 million people died from this disease that affected the lungs in the same year. World TB Day is

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celebrated every year to raise public awareness of TB. March 24 is World TB Day, which is observed every year. However, the same program goal was to reduce TB in the community.[3]

The most commonly performed radiographic examination to assess the lungs, heart, and chest cavity is a thoracic photograph that depicts the blood vessels, spine, heart, and respiratory tract.[4] One of the common radiologic examinations for pulmonary tuberculosis is a thoracic photograph with posteroanterior (PA) and anteroposterior (AP) projections. Other examinations that may be performed upon clinical indication include lateral, top-lordotic, oblique, and CT-Scan thoracic photographs. Upon examination of thoracic photographs, tuberculosis can produce images of various shapes. Radiologic features indicating active TB lesions are cloudy or nodular shadows in the apical and posterior parts of the upper lobes of the lungs, as well as in the upper parts of the lower lobes, cavities, especially more than one, surrounded by miliary spot shadows or cloudy or nodular shadows, and pleural effusions, usually unilateral or bilateral. Radiologic features suspicious for inactive TB lesions include fibrosis, calcification, pleural thickening, and Schwarte.[5] Based on the differences in the results of the examination in patients, the authors are interested in raising the issue of changes in the results of thorax photographs in patients with pulmonary TB before and after treatment at Royal Prima Hospital.

Method

This retrospective cohort study aimed to analyze the changes in chest X-ray findings among patients with pulmonary tuberculosis (TB) before and after treatment. The study was conducted at the Royal Prima Medan Hospital, with data collected from May 2023 to May 2024. The study sample comprised 30 TB patients who met the inclusion criteria, namely, patients without complications and with complete medical records. The data collected included patient demographics, treatment history, and chest X-ray results. Data analysis was performed using the IBM SPSS Statistics 27. Statistical analysis was performed using the t-test. The t-test was chosen to test the hypothesis of a significant difference in thoracic photographs between the two groups, namely, pulmonary tuberculosis patients who had undergone treatment and those who did not.

Results

Table 1 presents a breakdown of the treatment status and thoracic photographs of patients with pulmonary tuberculosis (TB). Ten patients (33.3%) did not receive any treatment for TB. This finding suggests that a significant proportion of patients may have been undiagnosed or had discontinued treatment. Twenty patients (66.7%) had already undergone TB treatment. This indicates that a relatively higher number of patients were actively engaged in the treatment process. Eleven patients (20.8%) showed no change in the chest X-ray results. This could indicate that disease progression has stabilized, or that treatment does not effectively address the infection. Twenty patients (37.7%) exhibited changes on their chest radiographs. This suggests that the disease may progress or that treatment has a positive impact on the infection.

Table 1. Percentage of pulmonary TB patient treatment and thorax photo results

Variable	n	%
Treatment		
Not on treatment	10	33.3
Already on treatment	20	66.7
Thorax photo results		
No change	11	20.8
There is a change	20	37.7

Table 2. T test result

Model		t	Sig.
1	(Constant)	1.018	.317
	pasien TB Paru	5.292	.000

Based on the table of t-test results above, it can be seen that the significance value of the relationship between the independent and dependent variables is 0.000 (<0.05). Therefore, it can be concluded that there is a difference in thoracic photographs between patients who are undergoing treatment and those who have not.

Discussion

Thoracic photography in patients with pulmonary TB was performed to observe and monitor the progress of treatment. The thorax photograph shows infiltrating lesions in the upper lungs, calcium deposits from the primary lesions, or fluid accumulation. Changes that indicate the development of tuberculosis include the presence of cavities and fibrous areas.

This study aimed to determine whether there were differences in the results of thoracic photographs of pulmonary TB patients before and after treatment. Pulmonary TB patients at Royal Prima Medan Hospital were found to be 59 patients from May 2023 to May 2024. Twenty pulmonary TB patients had repeated or more than one thorax photograph. The number of patients who had undergone treatment was 20 (66.7%), which was higher than that of patients who did not undergo treatment (10 patients, 33.3%).

In this study, the results of patient thorax photographs showed that as many as 15 TB patients (50%) had no changes in the results of thorax photographs, and 15 TB patients (50%) showed changes in the results of thorax photographs. There patients 15 pulmonary TB who had undergone treatment experienced changes in the thoracic photographs. Meanwhile, five patients with pulmonary TB who had undergone treatment did not experience changes in the thoracic photographs. Ten patients with pulmonary TB who did not undergo treatment did not experience changes in their thoracic photographs.

This study is in line with research conducted by Putrama[6] has the result that patients who are obedient to undergo treatment are more likely to get improved thorax photo results compared to patients who are not obedient to undergo treatment. Likewise, research conducted by Putra et al[7] that the results of thorax photos in adult pulmonary TB patients undergoing treatment experienced changes in lesion area.

Conclusion

There was a statistically significant difference in thoracic photographs between patients who had undergone TB treatment and those who had not. This suggests that treatment may have an impact on the progression or resolution of PTB. A significant proportion of the patients (33.3%) did not receive any treatment for TB. This highlights the need for improved diagnosis and treatment adherence among TB patients with TB. A relatively high number of patients (66.7%) were actively engaged in TB treatment. This indicated a positive trend in treatment uptake. A substantial number of patients (37.7%) exhibited changes in chest radiographs. This finding suggests that the disease may progress or respond to treatment. A significant proportion of patients (20.8%) showed no change in the chest X-ray results. This could indicate disease stabilization or ineffective treatment. Further research is needed to explore the factors influencing treatment outcomes and to develop strategies to improve treatment adherence and patient outcomes.

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