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# Identification of Respondent Characteristics and Relationship of Clinical Manifestations with Chest Radiograph Lesion in Pulmonary Tuberculosis Patients at Aloei Saboe Hospital

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## ABSTRACT

**Introduction:** Tuberculosis (TB) is an infectious infectious disease caused by *Mycobacterium tuberculosis*. This study aimed to determine the relationship between clinical manifestations and the results of chest radiographs in adult pulmonary TB patients at Aloei Saboe Hospital.
**Method:** The research design used in this study was cross-sectional by examining the relationship between clinical manifestations and chest radiography results in adult pulmonary TB patients at Aloei Saboe Hospital from October to November 2022. The population of this study was adult pulmonary TB patients using accidental sampling as a sampling technique. The research instrument used was the medical record which contained the patient's anamnesis status and the results of the chest radiography examination. The relationship between variables was then analyzed using the Kolmogorov-Smirnov test.
**Results:** Of the 44 samples, the most common clinical manifestations were dyspnea and chest pain in 12 patients (26.67%). The most chest radiographic results were fibrotic in 21 patients (47.7%). According to the American Thoracic Association (ATA) classification, extensive lesions were predominantly found in 21 patients (47.7%). There was an association between productive cough and chest radiography results (p=0.012). Meanwhile, chest radiographs were not associated with productive cough, hemoptoe, and dyspnea.
**Conclusion:** There is a relationship between productive cough and chest radiography lesions. Further study may determine samples for research that are minimally biased so that the results obtained are more representative of the population.

**Key words:** Chest radiograph, clinical manifestation, lung tuberculosis

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## Introduction

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis.* The main symptom of pulmonary TB patients is a productive cough for two weeks or more. Cough may be followed by additional symptoms, namely hemoptoe, shortness of breath, weakness, decreased appetite, decreased body weight, malaise, night sweats without physical activity, and malaise for over a month.[1]

In addition to the findings of clinical symptoms, the diagnosis of pulmonary TB can also be established from the results of additional investigations. One of the supporting examinations for TB is a chest X-ray. Based on data from the evidence-based guidebook, only 5% of reactive pulmonary TB patients have normal chest X-rays, while the rest are abnormal. The sensitivity and specificity of chest X-rays in diagnosing pulmonary TB are 86% and 83% if apical lesions, cavities, and reticulonodular features are found.[2]

The worst impact of TB disease is death.[3] Pulmonary tuberculosis causes physical effects such as weight loss and pale appearance. This situation will affect self-esteem and other psychological aspects of pulmonary tuberculosis patients.[4]

Geographically, in 2020 the most TB cases within the scope of the World Health Organization (WHO) work area are in Southeast Asia (43%). Indonesia is the third country with a percentage of 8.4% after India (26%) and China (8.5%).[5] Data from the Ministry of Health of the Republic of Indonesia shows that the number of pulmonary TB cases found and treated in 2021 is 824,000. In Gorontalo Province, particularly the Gorontalo City area, the number of pulmonary TB patients in 2021 was recorded at 925 cases.

In clinical events, clinical manifestations of pulmonary TB did not determine the presence of chest radiographic findings typical of pulmonary TB. Based on the description above and to find out whether patients with clinical manifestations of TB will show a typical chest radiographic lesion of TB and support the 2020-2024 Tuberculosis Control Strategy program in Indonesia, the characteristics of respondents and the relationship between clinical manifestations and radiographic examination results must be confirmed at Aloei Saboe Hospital.

## Methods

This research was conducted at the Aloei Saboe Hospital, Gorontalo City, Gorontalo Province, in October 2022. The research design used in this study was cross-sectional with observational analytic research, which was analyzed descriptively by studying the relationship between clinical manifestations and chest radiographic lesions of adult

pulmonary TB patients in Aloei Saboe Hospital. The independent variable in this study was the clinical manifestations of adult TB patients, and the dependent variable was the chest radiograph of adult pulmonary TB patients.

The population of this study was adult pulmonary TB patients at Aloei Saboe Hospital from September to October 2022. In determining the sample, the inclusion and exclusion criteria were applied. In taking the sample of this study using accidental sampling technique obtained from hospital medical records. The secondary data source was obtained from medical record archives of adult pulmonary TB patient status at Aloei Saboe Hospital.

Univariate analysis was used to determine the frequency distribution of tuberculosis. Tuberculosis was analyzed to describe the respondents' characteristics, including age and gender. In addition, univariate analysis can also be used for both variables, namely clinical manifestations and chest radiographic examination results in pulmonary TB patients. Bivariate analysis was used to determine whether there was a statistically significant relationship between the dependent and independent variables using the Kolmogorov-Smirnov test using SPSS 25.0 For Windows.

**Results**

Table 1 shows the characteristics of the 44 patients who were sampled. Based on age, the most were aged 46-55 in 13 patients (29.5%), where the youngest patient was 20 years old and the oldest was 80. Based on gender, the TB patients were 27 men (61.4%) and 17 women (38.6%). The most common clinical manifestations were dyspnea and chest pain in 12 patients (26.67%), respectively, hemoptoe in 11 (24.44%) patients, and lastly, productive cough in 10 patients (22.22%). Based on chest radiograph results, most of the patients had fibrotic lesions in 21 patients (47.7%), then patchy consolidation in 13 patients (29.5%) and cavities in 10 patients (22.7%). The dominant ATA classification lesions found in the sample were far advanced lesion in 21 patients (47.7%), followed by minimal lesions in 20 patients (45.5%).

Table 2 shows the relationship between age and gender with chest radiographic features. Patchy consolidation was mostly found in the late elderly (46.1%) and male gender (69.2%). In comparison, cavity lesions were mostly found in late adulthood and early elderly (30%) in males, while fibrotic lesions were most commonly found in the early elderly (36.8%) and males.

**Table 1.** Baseline Characteristics of The Lung Tubeculosis Patients

| Characteristics | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age (Years)** | | |
| 17-25 | 3 | 6.8 |
| 26-35 | 2 | 4.5 |
| 36-45 | 7 | 15.9 |
| 46-55 | 13 | 29.5 |
| 56-65 | 12 | 27.3 |
| >65 | 7 | 15.9 |
| **Gender** | | |
| Male | 27 | 61.4 |
| Female | 17 | 38.6 |
| **Clinical Manifestation** | | |
| Productive Cough | 10 | 22.22 |
| Hemoptoe | 11 | 24.44 |
| Dyspnea | 12 | 26.67 |
| Chest Pain | 12 | 26.67 |
| **Chest Radiograph** | | |
| Patchy consolidation | 13 | 29.5 |
| Cavity | 10 | 22.7 |
| Fibrotic | 21 | 47.7 |
| **ATA Classfication** | | |
| Minimal lesion | 20 | 45.5 |
| Moderate lesion | 3 | 6.8 |
| Far Adcanced lesion | 21 | 47.7 |

ATA: American Thoracic Association

**Table 2.** Age and Gender Categories Based on Thoracic Radiography

| Characteristics | Chest Radiograph Finding (n,%) | | |
|---|---|---|---|
| | Patchy Consolidation (N=13) | Cavity (N=10) | Fibrotic (N=21) |
| **Age (Years)** | | | |
| 17-25 | 1 (7.7) | 0 (0) | 2 (10.5) |
| 26-35 | 0 (0) | 2 (20) | 1 (5.2) |
| 36-45 | 2 (15.4) | 3 (30) | 2 (10.5) |
| 46-55 | 3 (23) | 3 (30) | 7 (36.8) |
| 56-65 | 6 (46.1) | 3 (30) | 5 (26.3) |
| >65 | 1 (7.7) | 1(10) | 4 (21) |
| **Gender** | | | |
| Male | 9 (69.2) | 7 (70) | 11 (52.3) |
| Female | 4 (30.7) | 3 (30) | 10 (47.6) |

Table 3 shows the relationship between clinical manifestations and chest radiographic findings. There was a significant association between productive cough and chest radiology results (p=0.012). In contrast, there was no significant association between hemoptoe, dyspnea, and chest pain with the chest radiography findings (all p > 0.05).

**Table 3.** Relationship of Clinical Manifestations with Chest Radiography Results

| Clinical Manifestation | Chest Radiograph Finding (n,%) | | | p-value |
|---|---|---|---|---|
| | Patchy Consolidation (N=13) | Cavity (N=10) | Fibrotic (N=21) | |
| **Productive cough** | | | | |
| Yes | 4 (30.8) | 5 (50) | 0 (0) | 0.012 |
| No | 9 (69.2) | 5 (50) | 21 (100) | |
| **Hemoptoe** | | | | |
| Yes | 4 (30.8) | 1 (10) | 6 (28.6) | 1.000 |
| No | 9 (69.2) | 9 (90) | 15 (71.4) | |
| **Dyspnea** | | | | |
| Yes | 4 (30.8) | 2 (20) | 6 (28.6) | 1.000 |
| No | 9 (69.2) | 8 (80) | 15 (71.4) | |
| **Chest Pain** | | | | |
| Yes | 1 (7.7) | 2 (20) | 9 (42.9) | 0.172 |
| No | 12 (92.3) | 8 (80) | 12 (57.1) | |

*Kolmogorov-SmirnovTest*

Table 4 shows the relationship between clinical manifestations and the classification of lung lesions based on ATA. There was no significant relationship between productive cough, hemoptoe, dyspnea, and chest pain with the classification of lung lesions by ATA (all p> 0.05).

**Table 4.** Association of Clinical Manifestations with Classification of Lung Lesions by the American Thoracic Society

| Clinical Manifestation | ATA Classification (n,%) | | | p-value |
|---|---|---|---|---|
| | Minimal lesion (N=20) | Moderate lesion (N=3) | Far Advanced lesion (N=21) | |
| **Productive cough** | | | | |
| Yes | 3 (15) | 1 (33.3) | 5 (23.8) | 0.996 |
| No | 17 (85) | 2 (66.7) | 16 (76.2) | |
| **Hemoptoe** | | | | |
| Yes | 6 (30) | 1 (33.3) | 4 (19) | 0.991 |
| No | 14 (70) | 2 (66.7) | 17 (81) | |
| **Dyspnea** | | | | |
| Yes | 6 (30) | 1 (33.3) | 5 (23.8) | 1.000 |
| No | 14 (70) | 2 (66.7) | 16 (76.2) | |
| **Chest Pain** | | | | |
| Yes | 5 (25) | 0 (0) | 7 (33.3) | 0.992 |
| No | 15 (75) | 3 (100) | 14 (66.7) | |

*Kolmogorov-Smirnov Test*

## Discussion

Based on age, in this study, the most were aged 46-55 in 13 patients (29.5%), where the youngest patient was 20 years old and the oldest was 80 years old. This is following

Indonesia's health profile in 2018. The highest positive smear TB cases were in the age group 45-54 years.[6] This is thought to be influenced by the adult group being a productive group interacting more socially. Adults have high mobility and social interaction due to various work activities, education, religion, hobbies, sports, arts, organizations and other crowds. During social interaction, TB transmission can occur.[7] Another assumption could also be due to decreased local immunity in the lungs of the elderly. This is related to lifestyle (smoking) or comorbid conditions that can cause susceptibility to reactivation in the lungs.[8]

In this study, based on gender, the most TB patients were 27 patients (61.4%), then 17 women (38.6%). This follows previous research that the respondents predominantly constituted males (66%), and there was a relationship between gender and the incidence of pulmonary TB (p-value = 0.006). This is presumably due to the movement and working hours of men, which are higher than women. Moreover, the habit of smoking and drinking alcohol, which can alleviate the immmun, significantly increases the risk of developing TB. With these factors, men are much more susceptible to TB disease bacteria than women.[9] In addition, in the 2018 Indonesia Health Profile, the highest number of TB cases were in men.[6]

The most common clinical manifestations in the present study were dyspnea and chest pain, followed by hemoptoe and productive cough. This is not in line with a previous study which found that the most frequent complaint as the reason for patients coming to the hospital was productive cough. According to the theory of respiratory symptoms, productive cough for more than three weeks is the most common symptom in active TB. This difference is assumed to occur because as many as 34 patients in this study were patients with long active pulmonary TB, so the symptoms encountered by researchers were symptoms with extensive lung parenchymal damage, namely shortness of breath and chest pain.[8] Symptoms of shortness of breath arise if there is an enlargement of the lymph nodes at the hilus that press on the bronchi or pleural effusion, extension of parenchymal inflammation or billions. Meanwhile, chest pain is usually pleuritic due to the involvement of the pleura in the disease process.[10]

Patients with the most chest radiology results were fibrotic in 21 patients (47.7%), then patchy consolidation in 13 patients (29.5%) and cavities in 10 patients (22.7%). These results are not following previous studies, which found patchy consolidation as the most (79%) radiological finding.[8,11] Meanwhile, according to the ATA classification, patients with the most results were extensive lesions in 21 patients (47.7%), then minimal lesions in 20 patients (45.5%) and moderate lesions in 3 patients (6.8%). This is following a literature

review by Fariadi and Parhursip which suggests that most radiological lesions are far advanced lesions.[6,12] Researchers assume that these results are related to the many old pulmonary TB patients with chronic infections who were identified. Fibrosis usually occurs due to chronic infection in the form of scar tissue. Fibrosis is a thread-like radiopaque appearance (more opaque than infiltrate) with the traction of the lung parenchyma around.[11]

This study had a significant relationship between productive cough and chest radiology results. This aligns with Karim's study which revealed significant relationship was obtained between productive cough and chest radiology. Theoretically, at the beginning of lung inflammation, until lung destruction finally occurs, dead tissue and cells will be removed as a cough reflex. Therefore, pulmonary TB patients generally have a productive cough with lots of bacilli in it so that the initial damage, which is depicted by cloud shadows and spots that have unclear boundaries with low density over time, will experience the process of destruction of lung tissue so that it will form cavities, namely the formation of holes due to softening of caseous necrosis which is often seen on chest X-ray images of cavities with smooth-walled walls.[13]

There was no significant relationship between hemoptoe and radiological lesions. This is in line with research by Karim (2013), which stated that there was no significant relationship between hemoptoe and the results of a chest radiolograph images.[8] In addition, Thorson et al., (2007) also showed that hemoptoe can show non-specific features such as cavities, pleuritis and miliary shadows.[14]

No significant relationship exists between dyspnea and the appearance of radiological lesions. This is in line with Thorson et al, (2007), who stated that patients with symptoms of shortness of breath often display pleurisy.[14] In addition, there is no significant relationship between chest pain and radiological lesions. This is not following the literature that chest pain arises when there is pleural involvement (infiltration to the pleura) in the disease process.[10]

Based on the ATA classification, there was no significant relationship between productive cough and hemoptoe with radiological lesions. These results are not in line with research by Karim (2013), which states that there is a significant relationship between productive cough and the results of a chest photo examination based on the ATA Classification (p-value = 0.000). However, in the same study, there was no relationship between hemoptoe and ATA classification. According to the theory, it is estimated that pulmonary TB directly affects the pulmonary arteries and causes coughing up blood so that lesions in the form of cavities, infiltrates and atelectasis are found. Cavities in TB patients in

any position will still be round shadows but are superposed with other lesions and are not certain to involve blood vessels.[8] However, based on a case report on a TB patient by Doroftei et al. (2021), coughing up blood was found even without lesions in the lungs with long-term inflammation and only bilateral reticular shadows were found. Researchers assume that the extent of TB patients' lesions in long-term or chronic inflammation can give a more dismal picture so that the difference between coughing up blood and the area of the lesion cannot influence.[15]

Based on the ATA classification, the absence of a relationship between dyspnea and the lesion size is not in line with the literature, which describes that dyspnea is found when lung damage is extensive. However, there is no association between dyspnea and lesion size, according to Karim's study. It is also possible that shortness of breath occurs due to pleural abnormalities in TB patients, such as pleural effusion, so pleural thickening is seen, which is difficult to relate to the extent of the lesion purely due to pulmonary TB. In addition, chest pain that is not related to the size of the lesion based on the ATA classification is not following the literature that chest pain arises when the nervous system in the pleura is affected, so it is difficult for researchers to relate it to the size of the lesion.[13]

The recent results found in this study mostly have no relationship between the variables. This is due to the results of the chest radiography examination, which cannot stand alone to determine the specific clinical manifestations that occur. According to Ismail, radiographic abnormalities in pulmonary TB patients also have similarities with other lung diseases, such as lung disorders caused by fungi, because the lesions are most often found in the upper lung fields and accompanied by the formation of cavities. In addition, pulmonary TB lesions can also resemble infiltrates, such as upper lobe lobar pneumonia, which is in its resolution period and takes the form of patches resembling tuberculosis nests.[10]

Main limitation of the study was regarding the sampling technique, namely accidental sampling. In addition, only taking the research location in one hospital so that the sample was not representative of new and old pulmonary TB cases, which caused bias when grouping clinical manifestations and chest radiographic results.

## Conclusion

From the results of the study, it was found that the latest elderly showed radiological images of cloudy shadows and spots (46.1%), the most frequent cavity images were in late adulthood (30%), and the most fibrotic features were found in early elderly age (36.8%). The male gender, on all radiological features, is more dominant in patchy consolidation (69.2%),

cavities (70%) and fibrotic (52.3%). The most common clinical manifestations were dyspnea and chest pain in 12 patients (26.67%). Patients with the most chest radiology results were found to be fibrotic in 21 patients (47.7%), while according to the ATA classification, patients with the most results, namely extensive lesions, were 21 patients (47.7%). The results of the statistical hypothesis test with Kolmogorov-Smirnov obtained a p-value =of 0.012. It can be concluded that there is a significant relationship between productive cough and chest radiology results.

**Conflicts of Interest**

Nothing to declare

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**References**

1. Kemenkes RI. Tuberkulosis ( TB ). *Tuberkulosis*. 2018;1(april):2018.
2. Nurmalasari. Pemeriksaan Radiografi Thorax Dengan Kasus Tuberkulosis Paru. *KOCENIN Serial Konferensi No1*. 2020;1(1):1-6.
3. Susilo Wulan. Analisis Beban Ekonomi dan Dampak Karena Tuberkulosis Terhadap Kesejahteran di Kota Bengkulu. *CHMK Health Journal*. 2020;4(Januari):0-7.
4. Sutarlan N. Tb paru dapat mengganggu keadaan fisik dan psikososial penderita yang mempengaruhi harga diri penderita TB paru. *Poltekes kesehatan Bandung*. 2021;41(2005):1-9.
5. WHO. *Global Tuberculosis Report 2021*. (Tuberculosis PG, ed.). WHO; 2021.
6. Fariadi FF. *Kajian Literatur Karakteristik Gejala Respiratorik Dan Gambaran Foto Thorax Pasien Tuberkulosis Paru*. Universitas Hasanuddin; 2020.
7. Pramono JS. Tinjauan literatur: Faktor risiko peningkatan angka insidensi tuberkulosis. *Jurnal Ilmiah Pannmed*. 2021;16(1):106-113.
8. Karim K. Hubungan Manifestasi Klinis dan Hasil Pemeriksaan Foto Toraks dalam Mendiagnosa TB di RSU Kota Tanggerang Selatan pada Tahun 2013. Published online 2013.
9. Sikumbang RH, Eyanoer PC, Siregar NP. Faktor-Faktor Yang Berhubungan Dengan Kejadian Tb Paru Pada Usia Produktif Di Wilayah Kerja Puskesmas Tegal Sari Kecamatan Medan Denai Tahun 2018. *Jurnal Kedokteran dan Kesehatan-Fakultas Kedokteran Universitas Islam Sumatera Utara*. 2022;21(1):32-43.
10. Mubaraq K. *Hubungan Gambaran Hasil Pemeriksaan Foto Thorax Dengan Kepositivan Hasil Pemeriksaan Sputum Pada Penderita TB Paru Di RSUD Pemerintah Kabupaten Aceh Timur Periode Januari 2018- Agustus 2019*. 2020.
11. Yan Marvellini R, Petronella Izaak R. Gambaran Radiografi Foto Thorax Penderita Tuberkulosis Pada Usia Produktif di RSUD Pasar Minggu (Periode Juli 2016 Sampai Juli 2017). *Jurnal Kedokteran Universitas Palangka Raya*. 2021;9(1):1219-1223. doi:10.37304/jkupr.v9i1.2860
12. Parhusip MBE. *Peranan Foto Dada Dalam Mendiagnosis Puskesmas Kodya Medan*.

USU; 2009.
13. Karim K. Hubungan Manifestasi Klinis dan Hasil Pemeriksaan Foto Toraks dalam Mendiagnosis TB di RSU Kota Tangerang Selatan pada Tahun 2013. Published online March 26, 2015. Accessed August 2, 2023. https://repository.uinjkt.ac.id/dspace/handle/123456789/26360
14. Thorson A, Long NH, Larsson LO. Chest X-ray findings in relation to gender and symptoms: a study of patients with smear positive tuberculosis in Vietnam. *Scand J Infect Dis*. 2007;39(1):33-37. doi:10.1080/00365540600951176
15. Doroftei B, Ciobica A, Ilie OD, Maftei R, Ilea C. Mini-Review Discussing the Reliability and Efficiency of COVID-19 Vaccines. *Diagnostics (Basel)*. 2021;11(4):579. doi:10.3390/diagnostics11040579