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Clinical and Demographic Profile of Pulmonary Tuberculosis Patients Based on AFB Examination Results at UKI General Hospital, Jakarta

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ABSTRACT

Pulmonary tuberculosis (TB), caused by *Mycobacterium tuberculosis*, remains a major public health concern in Indonesia. This study described Acid-fast bacilli (AFB) examination results among pulmonary TB patients at Universitas Kristen Indonesia General Hospital from January to December 2023. A descriptive quantitative design was applied using medical records and total sampling of 41 patients. Univariate and bivariate analyses were conducted. Positive AFB results were found in 31 patients (75.6%), while 10 (24.4%) were negative. Most patients were aged 15–64 years (70.7%) and male (65.9%). AFB positivity was higher among males (81.5%) than females (64.3%). Overall, positive AFB results predominated, particularly among male and productive age patients.

INTRODUCTION

Pulmonary tuberculosis (TB) remains an important infectious disease caused primarily by *Mycobacterium tuberculosis*. The bacterium mainly affects the lungs and can spread from an infected individual through airborne respiratory particles. *M. tuberculosis* is an aerobic, rod-shaped bacterium characterized by a lipid-rich cell wall containing high concentrations of mycolic acids. This distinctive cell-wall structure enables the organism to retain specific dyes despite acid-alcohol decolorization, resulting in its classification as an acid-fast bacillus (AFB). The complex lipid composition also contributes to the organism's environmental persistence and relatively slow growth compared with many other pathogenic bacteria (Buntuan, 2014; Puskesmas Kuta 2, 2023).

Pulmonary TB continues to represent a substantial public health concern because transmission can occur directly within communities, particularly from patients with bacteriologically confirmed disease. Individuals with pulmonary TB who have detectable AFB in their sputum constitute an important source of transmission because the presence of bacilli indicates active bacterial excretion from the respiratory tract.

Previous studies in Indonesia have demonstrated that microscopic AFB examination remains an important component in the identification and evaluation of pulmonary TB cases in different healthcare settings (Fitriyani, 2019; Febriani et al., 2022). Therefore, early detection of infectious cases is essential for initiating appropriate treatment and reducing further transmission.

Microscopic sputum examination for AFB has been widely used as a bacteriological method for evaluating patients suspected of pulmonary TB. The method enables healthcare professionals to identify acid-fast organisms in sputum specimens and provides clinically relevant information regarding bacterial presence.

Nurdiani et al. (2022) reported that AFB microscopy, alongside molecular diagnostic methods such as GeneXpert, contributes to the laboratory assessment of patients suspected of having TB. Although molecular diagnostic technologies provide greater sensitivity and additional information regarding drug resistance, sputum microscopy remains relevant in many clinical settings because it is relatively accessible and can support routine diagnosis and treatment monitoring.

AFB examination is also important during the treatment of pulmonary TB. Successful treatment is expected to reduce the bacterial burden and eventually result in sputum conversion from AFB-positive to AFB-negative. Suriani (2020) demonstrated differences in AFB examination results before and after TB treatment, emphasizing the importance of bacteriological monitoring throughout therapy.

Similarly, Masitah (2019) highlighted the role of microscopic sputum examination in detecting AFB among individuals associated with confirmed TB cases. Regular bacteriological evaluation may therefore provide useful information regarding treatment response, persistence of infection, and the potential risk of continued transmission.

The distribution of pulmonary TB and AFB positivity may also differ according to demographic characteristics. Age represents an important factor because TB can affect individuals across the life course, although clinical characteristics, immune response, and disease presentation may vary among age groups. Older adults, for example, may have distinct clinical characteristics and increased vulnerability due to age-related physiological and immunological changes (Caraux-Paz et al., 2021).

Previous Indonesian studies have also reported variations in AFB findings among pulmonary TB patients across healthcare settings and patient groups (Buntuan, 2014; Nurdiyanti, 2023). Gender may similarly contribute to differences in the distribution of pulmonary TB cases and bacteriological findings. Describing these characteristics is important for identifying patient groups that account for a greater proportion of bacteriologically confirmed pulmonary TB cases.

Several previous studies have investigated AFB examination results among TB patients in hospitals, public health centers, and pulmonary healthcare facilities in Indonesia (Buntuan, 2014; Febriani et al., 2022; Fitriyani, 2019; Nurdiyanti, 2023). However, epidemiological and bacteriological patterns may differ according to population characteristics, healthcare facilities, geographical settings, and observation periods. Specific evidence regarding the distribution of AFB examination results among pulmonary TB patients at Universitas Kristen Indonesia General Hospital during 2023 remains limited. Institution-specific data are important for describing the local burden of bacteriologically confirmed pulmonary TB and supporting clinical and laboratory evaluation.

Therefore, this study aimed to describe the results of AFB examinations among pulmonary TB patients at Universitas Kristen Indonesia General Hospital from January to December 2023. The study also described the distribution of AFB examination results according to patients' age and gender. The findings are expected to provide local epidemiological evidence regarding the characteristics of pulmonary TB patients and support the evaluation of bacteriological findings in hospital-based TB services.

THEORETICAL REVIEW

Tuberculosis

Tuberculosis (TB) is a chronic infectious disease primarily caused by *Mycobacterium tuberculosis*. The disease most commonly affects the lungs and is therefore referred to as pulmonary tuberculosis, although extrapulmonary involvement may occur in the pleura, lymph nodes, bones, central nervous system, and other organs. *M. tuberculosis* is a rod-shaped, aerobic bacterium characterized by a lipid-rich cell wall containing mycolic acids. This characteristic enables the organism to retain staining even after exposure to acid-alcohol, which explains its classification as an acid-fast bacillus (AFB) (Buntuan, 2014; Raviglione, 2015). Pulmonary TB remains clinically important because patients with active disease can transmit the organism through respiratory secretions.

Clinical manifestations vary according to disease severity, immune status, and the extent of pulmonary involvement. Common manifestations include prolonged cough, sputum production, hemoptysis, chest discomfort, shortness of breath, fever, night sweats, weight loss, decreased appetite, and general weakness (Puskesmas Kuta 2, 2023; Raviglione, 2015).

Etiology and Transmission

Human tuberculosis is predominantly caused by *M. tuberculosis*, although other members of the *Mycobacterium tuberculosis* complex, including *M. bovis*, *M. africanum*, *M. microti*, and *M. canettii*, may also cause infection. Among these species, *M. tuberculosis* is the principal cause of human pulmonary TB and is transmitted mainly from person to person through the respiratory route (Raviglione, 2015).

Transmission occurs when individuals with infectious pulmonary or laryngeal TB release microscopic droplet nuclei into the air during coughing, sneezing, speaking, or aerosol-generating procedures. These small particles may remain suspended in the air and can reach the terminal bronchioles and alveoli when inhaled. The risk of transmission depends on the infectiousness of the source patient, the concentration of airborne bacilli, environmental ventilation, and the duration and proximity of exposure (Raviglione, 2015).

Poorly ventilated and crowded environments can increase the probability of TB transmission. Close and prolonged contact with an infectious individual also increases exposure. However, exposure to *M. tuberculosis* does not necessarily result in active disease because progression depends substantially on host immunity and other individual risk factors.

Risk Factors for Pulmonary Tuberculosis

The development of active TB reflects an interaction between exposure to *M. tuberculosis* and host susceptibility. Individuals with impaired immune function are at greater risk of progressing from infection to active disease. Important risk factors include HIV infection, prolonged immunosuppressive therapy, smoking, excessive alcohol consumption, diabetes mellitus, advanced age, young age, and close contact with infectious TB patients (Ristani, 2020; Raviglione, 2015).

Age is an important demographic factor because immune function changes throughout the life course. Children may have limited immune capacity against mycobacterial infection, whereas older adults may experience age-related decline in cellular immunity and higher prevalence of comorbidities. These conditions can increase susceptibility to active TB and may alter its clinical manifestations (Caraux-Paz et al., 2021). Occupational and environmental exposure also contributes to transmission risk. Healthcare workers and individuals living or working in congregate settings may experience more frequent contact with infectious TB cases.

Pathogenesis of Pulmonary Tuberculosis

Pulmonary TB begins when airborne droplet nuclei containing *M. tuberculosis* are inhaled and reach the alveoli. Alveolar macrophages

phagocytose the bacilli as part of the innate immune response. However, *M. tuberculosis* can survive within macrophages by interfering with intracellular antimicrobial mechanisms. The bacilli then replicate slowly within infected macrophages and initiate local inflammatory responses (Raviglione, 2015).

During the early stage of infection, infected macrophages and mycobacteria may migrate through lymphatic vessels to regional lymph nodes. Before effective cell-mediated immunity develops, bacilli may also enter the bloodstream and disseminate to other organs. Cellular immunity generally develops several weeks after primary infection and plays an essential role in limiting bacterial multiplication. Activated T lymphocytes stimulate macrophages and promote the formation of granulomas, which function to contain the infection.

Granulomatous inflammation may be accompanied by caseous necrosis. In most immunocompetent individuals, this immune response effectively controls bacterial proliferation, resulting in latent TB infection. Nevertheless, viable bacilli may persist within granulomatous lesions for prolonged periods and can reactivate when host immunity becomes compromised (Raviglione, 2015).

Primary and Post-Primary Tuberculosis

Primary TB occurs following initial exposure to *M. tuberculosis*. Inhaled bacilli reach the alveoli and initiate a localized inflammatory lesion known as the primary focus. The infection may spread through lymphatic channels to hilar lymph nodes, forming a primary complex. In many individuals, the immune system eventually controls the infection, and the lesion may undergo fibrosis or calcification.

Some bacilli, however, may remain viable in a dormant state and establish latent infection (Raviglione, 2015). Primary TB may remain asymptomatic, particularly in immunocompetent individuals. In patients with inadequate immune responses, however, bacilli may continue to multiply and disseminate locally or hematogenously. This process can result in progressive primary TB or extrapulmonary involvement.

Post-primary or secondary TB generally develops through reactivation of latent bacilli or, less commonly, reinfection with a new strain. Reactivation frequently occurs when cell-mediated immunity declines because of aging, HIV infection, immunosuppressive therapy, or other underlying conditions. Post-primary pulmonary TB commonly involves the upper lung regions and may result in extensive pulmonary lesions, tissue destruction, and cavitation. Patients with cavitary pulmonary disease frequently have a higher bacillary load and are more likely to produce positive sputum bacteriology results (Raviglione, 2015).

Diagnosis of Pulmonary Tuberculosis

Diagnosis of pulmonary TB requires the integration of clinical assessment and bacteriological testing. Individuals with pulmonary TB commonly present with persistent cough, sputum production, hemoptysis,

chest pain, dyspnea, fever, night sweats, decreased appetite, weight loss, and malaise. However, clinical manifestations alone are insufficient to confirm the diagnosis because similar symptoms may occur in other respiratory diseases (Puskesmas Kuta 2, 2023). Physical examination may reveal respiratory abnormalities depending on the extent and location of pulmonary involvement. Nevertheless, laboratory confirmation is particularly important for establishing bacteriologically confirmed pulmonary TB.

Acid-Fast Bacilli Examination

Bacteriological examination plays a major role in detecting *M. tuberculosis* among patients with suspected pulmonary TB. Sputum represents the most frequently examined specimen, although other biological samples may be required according to the clinical presentation and site of infection. Microscopic examination identifies acid-fast organisms based on their ability to retain specific staining after acid-alcohol decolorization.

AFB microscopy has long been used as a routine laboratory method for identifying infectious pulmonary TB cases. Positive sputum microscopy provides evidence of acid-fast organisms and may indicate substantial bacillary burden, particularly in patients with active pulmonary disease (Fitriyani, 2019; Febriani et al., 2022). Buntuan (2014) similarly demonstrated the relevance of AFB examination among patients clinically diagnosed with pulmonary TB.

AFB examination is also useful for monitoring bacteriological changes during treatment. Conversion from AFB-positive to AFB-negative sputum is considered an important indicator of reduced bacterial burden and treatment response. Suriani (2020) reported differences in microscopic AFB findings before and after treatment, supporting the role of sputum examination in treatment monitoring. Nurdianti (2023) also described AFB examination results among pulmonary TB outpatients and patients undergoing follow-up.

Current laboratory evaluation may combine conventional microscopy with molecular diagnostic methods. Nurdiani et al. (2022) demonstrated the use of both AFB microscopy and GeneXpert among patients suspected of TB. Molecular testing offers additional diagnostic capabilities, including detection of *M. tuberculosis* genetic material and specific drug-resistance markers. However, AFB microscopy remains clinically relevant in settings where it continues to be routinely used for bacteriological evaluation.

Differences in AFB examination results may occur according to demographic and clinical characteristics. Age, sex, immune status, disease severity, and treatment status may affect the probability of obtaining a positive result. Therefore, describing the distribution of AFB examination results according to patient characteristics can provide useful epidemiological information and contribute to the evaluation of pulmonary TB patterns within specific healthcare settings (Febriani et al., 2022; Nurdianti, 2023).

In the present study, the theoretical framework emphasizes pulmonary TB as an infectious respiratory disease, the biological mechanisms underlying *M. tuberculosis* infection, factors associated with disease development, and the role of AFB examination in bacteriological evaluation. This framework provides

the conceptual basis for describing AFB examination results among pulmonary TB patients according to age and sex at Universitas Kristen Indonesia General Hospital.

METHODOLOGY

This study employed a descriptive quantitative design using a retrospective approach to describe acid-fast bacilli (AFB) examination results among patients with pulmonary tuberculosis at Universitas Kristen Indonesia General Hospital (RSU UKI). The study used secondary data obtained from patients' medical records covering the period from January to December 2023. Data collection was conducted at RSU UKI from March to May 2024.

The study population consisted of patients examined at RSU UKI who presented with respiratory complaints, particularly a cough lasting more than two weeks, and who were subsequently evaluated for pulmonary tuberculosis. The study sample comprised all patients diagnosed with pulmonary tuberculosis whose medical records met the predetermined eligibility criteria. A total sampling technique was applied, meaning that all eligible medical records available during the study period were included in the analysis. Based on the available records, 41 patients met the study criteria and were included in the final analysis.

The inclusion criteria consisted of patients with a confirmed diagnosis of pulmonary tuberculosis during the January to December 2023 period and patients whose medical records contained complete information required for the study, including age, sex, and AFB examination results. Medical records were excluded when patients presented with similar respiratory symptoms but were diagnosed with conditions other than pulmonary tuberculosis, such as bronchopneumonia or asthma. Records with incomplete information on the variables analyzed were also excluded from the final dataset.

The variables analyzed in this study included age, sex, and AFB examination results. Age was recorded based on the patient's age documented in the medical record and was categorized into age groups for descriptive and comparative analysis. Age was treated as an ordinal variable. Sex was classified as male or female according to the information documented in the patient's medical record and was analyzed as a nominal variable. The primary outcome was the AFB examination result, which was classified as positive or negative and analyzed as a nominal variable. A positive AFB result indicated the detection of acid-fast bacilli on sputum microscopic examination, whereas a negative result indicated that acid-fast bacilli were not detected in the examined specimen.

Data were collected by reviewing medical records of pulmonary TB patients treated at RSU UKI during the specified study period. Before data collection, permission to access the relevant medical records was obtained from the appropriate hospital unit. Eligible records were subsequently identified and reviewed according to the inclusion and exclusion criteria. Information regarding age, sex, pulmonary TB diagnosis, and AFB examination results was

extracted and entered into a structured dataset. The collected data were checked for completeness, consistency, and accuracy before statistical analysis.

Data processing and statistical analysis were performed using IBM SPSS Statistics. Univariate analysis was used to summarize the characteristics of the study population and the distribution of AFB examination results. Categorical data were presented as frequencies and percentages. Bivariate analysis was subsequently conducted to describe the distribution of AFB examination results according to age group and sex. This analysis compared the proportion of positive and negative AFB results across demographic categories to identify patterns in bacteriological findings among pulmonary TB patients.

The research process consisted of identifying eligible medical records of pulmonary TB patients treated between January and December 2023, obtaining institutional permission for data access, collecting the required demographic and laboratory information, screening records according to eligibility criteria, verifying data completeness, coding and entering the data into SPSS, conducting statistical analysis, interpreting the findings, and preparing the final research report. Throughout the data management process, patient information was handled only for research purposes and analyzed without using personally identifying information in the reported results.

RESULTS AND DISCUSSION

A total of 41 medical records of patients diagnosed with pulmonary tuberculosis at Universitas Kristen Indonesia General Hospital were included in this study. The records covered patients treated between January and December 2023, while data collection was conducted from March 26 to May 8, 2024. All eligible records that met the inclusion and exclusion criteria were analyzed. The analysis focused on patient age, sex, and acid-fast bacilli (AFB) examination results.

Patient Characteristics by Age

Table 1 presents the distribution of patients according to age group. Of the 41 pulmonary TB patients, the majority were aged 15–64 years, comprising 29 patients (70.7%). Eight patients (19.5%) were aged >65 years, while four patients (9.8%) were aged <15 years.

Table 1. Distribution of Pulmonary Tuberculosis Patients by Age Group

Age Group	Frequency (n)	Percentage (%)
<15 years	4	9.8
15–64 years	29	70.7
>65 years	8	19.5
Total	41	100.0

Patient Characteristics by Sex

The sex distribution is presented in Table 2. Male patients accounted for 27 cases (65.9%), whereas female patients accounted for 14 cases (34.1%). Thus, approximately two-thirds of the pulmonary TB patients included in this study were male.

Table 2. Distribution of Pulmonary Tuberculosis Patients by Sex

Sex	Frequency (n)	Percentage (%)
Male	27	65.9
Female	14	34.1
Total	41	100.0

Acid-Fast Bacilli Examination Results

The distribution of AFB examination results is shown in Table 3. Positive AFB results were identified in 31 patients (75.6%), whereas 10 patients (24.4%) had negative AFB results. Therefore, AFB-positive pulmonary TB cases predominated in the study population.

Table 3. Distribution of Acid-Fast Bacilli Examination Results

AFB Result	Frequency (n)	Percentage (%)
Positive	31	75.6
Negative	10	24.4
Total	41	100.0

Distribution of AFB Examination Results by Sex

Table 4 presents the distribution of AFB examination results according to sex. Among 27 male patients, 22 (81.5%) had positive AFB results, and five (18.5%) had negative results. Among 14 female patients, nine (64.3%) were AFB-positive, and five (35.7%) were AFB-negative. Descriptively, the proportion of AFB positivity was higher among male patients than among female patients.

Table 4. Distribution of Acid-Fast Bacilli Examination Results by Sex

Sex	AFB Positive, n (%)	AFB Negative, n (%)	Total, n (%)
Male	22 (81.5)	5 (18.5)	27 (100.0)
Female	9 (64.3)	5 (35.7)	14 (100.0)
Total	31 (75.6)	10 (24.4)	41 (100.0)

Distribution of AFB Examination Results by Age Group

The distribution of AFB results according to age group is presented in Table 5. All four patients aged <15 years had positive AFB results. Among patients aged 15–64 years, 21 of 29 patients (72.4%) were AFB-positive, and eight (27.6%) were AFB-negative. Among those aged >65 years, six of eight patients (75.0%) were AFB-positive, and two (25.0%) were AFB-negative.

Table 5. Distribution of Acid-Fast Bacilli Examination Results by Age Group

Age Group	AFB Positive, n (%)	AFB Negative, n (%)	Total, n (%)
<15 years	4 (100.0)	0 (0.0)	4 (100.0)
15-64 years	21 (72.4)	8 (27.6)	29 (100.0)
>65 years	6 (75.0)	2 (25.0)	8 (100.0)
Total	31 (75.6)	10 (24.4)	41 (100.0)

The findings demonstrated that pulmonary TB at RSU UKI during 2023 occurred predominantly among individuals aged 15–64 years. Of the 41 patients, 70.7% belonged to this age group. This finding indicates that pulmonary TB substantially affects individuals in economically and socially active stages of life. Individuals in this age category generally have greater mobility, occupational activity, and social interaction, which may increase their opportunities for exposure to *Mycobacterium tuberculosis*. Previous Indonesian studies have similarly reported a substantial proportion of pulmonary TB cases among productive-age populations (Nurdiyanti, 2023).

Although patients aged > 65 years represented only 19.5% of the study population, this age group remains clinically important. Aging is associated with physiological changes in immune function that may reduce the ability to control latent or newly acquired *M. tuberculosis* infection. Older patients may also have comorbid conditions that increase susceptibility to active TB. Caraux-Paz et al. (2021) emphasized that TB in older adults presents particular clinical challenges because age-related immune dysfunction, comorbidities, and atypical disease presentation may influence diagnosis and disease progression.

A predominance of male patients was also observed. Males accounted for 65.9% of all pulmonary TB cases, compared with 34.1% among females. This pattern is consistent with previous studies reporting a higher occurrence of pulmonary TB among males (Buntuan, 2014; Febriani et al., 2022). Several behavioral and environmental factors may contribute to this distribution. Men may have greater occupational and social exposure to infectious environments and may also have a higher prevalence of behaviors such as smoking. Tobacco smoke can impair respiratory defense mechanisms, including mucociliary clearance and pulmonary immune responses, thereby potentially increasing susceptibility to respiratory infections, including TB.

The most prominent finding of this study was the high proportion of positive AFB examination results. Of the 41 pulmonary TB patients, 31 patients (75.6%) were AFB-positive. A positive AFB examination indicates the presence of acid-fast organisms in the sputum specimen and, in the appropriate clinical context, supports bacteriological evidence of pulmonary TB. AFB microscopy remains relevant because it can identify patients with a substantial bacillary burden who may have an increased potential for disease transmission. Similar findings have been reported in previous hospital- and laboratory-based studies evaluating AFB examination among pulmonary TB patients (Buntuan, 2014; Febriani et al., 2022).

Nevertheless, 24.4% of patients in this study had negative AFB results despite having a diagnosis of pulmonary TB. A negative microscopic AFB result does not necessarily exclude pulmonary TB. The sensitivity of sputum microscopy is influenced by several factors, including bacillary load, specimen quality, disease stage, previous treatment, and technical aspects of specimen collection and laboratory processing. Therefore, patients with clinically suspected TB and negative AFB microscopy may require additional bacteriological or molecular diagnostic evaluation. Nurdiani et al. (2022) demonstrated the

complementary role of GeneXpert and AFB microscopy in the assessment of patients suspected of having TB.

When AFB results were analyzed according to sex, 81.5% of male patients had positive results compared with 64.3% of female patients. This descriptive difference indicates that AFB positivity was more frequently observed among males in the present sample. The greater proportion of positive results among males may relate to differences in exposure, smoking behavior, delayed healthcare-seeking behavior, or disease severity at the time of examination. However, because no inferential statistical test and corresponding *p*-value were reported, these findings should be interpreted as descriptive patterns rather than evidence of a statistically significant association between sex and AFB positivity.

Differences in AFB positivity were also observed across age groups. All four patients aged <15 years had positive AFB results, representing 100% positivity in this group. However, this result should be interpreted cautiously because the group contained only four patients. A percentage based on such a small subgroup may appear high but may not represent the broader pediatric TB population.

Among patients aged 15–64 years, 72.4% had positive AFB results, while 75.0% of patients aged >65 years were AFB-positive. The proportion was therefore slightly higher among older adults than among patients aged 15–64 years, although the absolute number of positive cases was substantially greater in the 15–64-year age group because this category represented most of the study population. The relatively high proportion of positive findings among older patients may reflect declining cell-mediated immunity, increased comorbidity, or reactivation of latent infection associated with aging (Caraux-Paz et al., 2021).

These findings highlight an important distinction between the **number of cases** and the **proportion of AFB positivity**. The 15–64-year age group contributed the largest absolute number of AFB-positive patients, with 21 cases, whereas the <15-year group had the highest percentage of positivity at 100% but consisted of only four patients. Therefore, the findings should not be interpreted as indicating that children had the greatest overall burden of AFB-positive pulmonary TB at RSU UKI.

Overall, the results demonstrate that pulmonary TB cases at RSU UKI in 2023 were predominantly observed among males and individuals aged 15–64 years, with AFB-positive results representing more than three-quarters of the study population. The findings provide a descriptive overview of the demographic and bacteriological characteristics of pulmonary TB patients at this hospital. Nevertheless, the relatively small sample size, particularly within the <15-year and >65-year subgroups, should be considered when interpreting differences in AFB positivity across demographic categories.

CONCLUSIONS AND RECOMMENDATIONS

This study described acid-fast bacilli (AFB) examination results among pulmonary tuberculosis patients at Universitas Kristen Indonesia General Hospital from January to December 2023. Of the 41 patients included in the analysis, 31 patients (75.6%) had positive AFB results, while 10 patients (24.4%)

had negative results. Most patients were aged 15–64 years, accounting for 29 cases (70.7%), followed by patients older than 65 years with 8 cases (19.5%) and those younger than 15 years with 4 cases (9.8%). Based on AFB examination results, all patients younger than 15 years were AFB-positive. Among patients aged 15–64 years, 72.4% were AFB-positive, and 27.6% were AFB-negative, while 75.0% of patients older than 65 years were AFB-positive and 25.0% were AFB-negative.

Male patients constituted the majority of the study population, with 27 cases (65.9%), compared with 14 female patients (34.1%). AFB positivity was also proportionally higher among males, with 81.5% of male patients testing positive compared with 64.3% of female patients. Overall, the findings indicate that pulmonary TB patients in this study were predominantly of productive age, male, and AFB-positive. However, because this study used a descriptive retrospective design with a relatively small sample, the observed differences according to age and sex should be interpreted cautiously and should not be considered evidence of causal or statistically significant relationships.

Future studies are recommended to include larger sample sizes and involve multiple healthcare facilities to improve the representativeness and generalizability of the findings. Additional clinical and behavioral variables, including smoking history, nutritional status, treatment adherence, HIV status, diabetes mellitus, immune status, previous TB treatment, and other relevant comorbidities, should also be considered to provide a more comprehensive analysis of factors associated with AFB positivity.

Further research may combine conventional AFB microscopy with more sensitive diagnostic methods, such as GeneXpert and mycobacterial culture, to improve diagnostic accuracy and allow comparison between different bacteriological methods. Longitudinal studies are also recommended to monitor changes in AFB status during anti-tuberculosis treatment. Repeated bacteriological assessments at defined treatment intervals may provide stronger evidence regarding sputum conversion, treatment response, and therapeutic outcomes, thereby supporting the improvement of clinical monitoring and tuberculosis control strategies.

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