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# Characteristics of Pulmonary Tuberculosis at RSUD 45 Kuningan in 2023 Toward a TB-Free Indonesia 2030

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**KEYWORDS**

*Pulmonary Tuberculosis; TB with comorbid DM; TB with HIV coinfection*

**ABSTRACT**

*Tuberculosis (TB) is a disease caused by Mycobacterium tuberculosis. As part of the strategy to end tuberculosis outlined in Presidential Regulation No. 67 of 2021, case detection for TB is one of the intensified measures for TB control and broader case tracking. The research aims to determine the characteristics of Pulmonary TB, Pulmonary TB with HIV coinfection, and Pulmonary TB with comorbid diabetes mellitus (DM). This is a descriptive observational study. The study population consisted of Pulmonary TB patients at RSUD 45 Kuningan in 2023. A total of 80 Pulmonary TB patients were identified at RSUD 45 Kuningan. The highest Characteristics of Pulmonary Tuberculosis at RSUD 45 Kuningan in 2023 Toward a TB-Free Indonesia 2030 by age was in those aged 57 years (n=5, 6.3%). Gender distribution comprised 53 males (66.3%) and 27 females (33.8%). Types of Pulmonary TB included 51 patients (63.8%) with clinical Pulmonary TB and 29 patients (36.3%) with bacteriological Pulmonary TB. Treatment history showed 76 new cases (95.0%), 3 relapsed cases (3.8%), and 1 defaulted case (1.3%), with no treatment failures. Pulmonary TB with HIV coinfection occurred in 12 patients (15.0%), while the rest had no HIV coinfection. Pulmonary TB with comorbid DM occurred in 2 patients (2.5%), while the majority had no comorbid DM. Pulmonary TB patients at RSUD 45 Kuningan were predominantly aged 57 years, male, and categorized as new cases. Among the patients, 2 had DM (2.5%), and 12 had HIV (15.0%). It is recommended to improve medical record documentation to enhance the understanding of Pulmonary TB status and investigate TB cases in children.*

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## INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium tuberculosis that can be transmitted through airborne droplets. Despite being a preventable and curable disease, TB remains one of the most pressing global health challenges. TB is the second leading cause of death from infectious diseases after COVID-19, and it is the leading cause of death related to antimicrobial resistance and among people living with HIV (PLHIV). According to the WHO Global Tuberculosis Report 2023, TB caused an estimated 1.3 million deaths globally in 2022, with an additional 187,000 deaths among HIV-positive individuals. The global incidence of TB was estimated at 10.6 million cases in 2022, representing a significant burden on healthcare systems worldwide, particularly in low- and middle-income countries (Kemenkes R.I, 2020; World Health Organization (WHO), 2023).

Indonesia ranks second globally after India for the highest number of TB cases, with an estimated incidence of 1,060,000 cases annually. The WHO Global Tuberculosis Report 2023 indicates that Indonesia has experienced an increase in TB incidence across almost all indicators. The year 2022 marked the highest incidence rate in the last decade and since the COVID-19 pandemic began, with 724,309 cases detected. This represents a 28% increase from 2021, reflecting both improved case detection and a genuine rise in disease burden. Furthermore, Indonesia accounts for approximately 10% of the global TB burden, making TB control a critical national health priority. The increasing trend in TB cases poses significant challenges to achieving the national and global targets for TB elimination by 2030 (World Health Organization [WHO], 2023).

Several factors contribute to the persistent TB burden in Indonesia and influence the characteristics of TB patients. These include socioeconomic factors such as poverty, malnutrition, and overcrowded living conditions; biological factors including age, gender, and immune status; behavioral factors such as smoking and alcohol consumption; and comorbidities, particularly diabetes mellitus and HIV infection. Understanding these factors and the demographic characteristics of TB patients is essential for developing targeted interventions and improving TB control strategies.

As an effort to combat tuberculosis as stated in Presidential Regulation number 67 of 2021, the discovery of TB cases and treatment is one of the health intensification of TB control. Case discovery is important for efforts in treatment and case tracking in a wider scope, and also as an optimization of TB case handling according to existing standards. Presidential Regulation No. 67 of 2021 emphasizes the importance of increasing case detection rates, ensuring treatment adherence, and strengthening health service quality to achieve the national TB elimination target. These regulatory frameworks mandate integrated approaches involving case finding, diagnosis, treatment, and prevention strategies across all healthcare levels (Nguyen et al., 2020; Subbaraman et al., 2019; Tlou, 2020).

This research is critically important for several reasons. First, despite national efforts to combat TB, the incidence continues to rise, indicating gaps in current control strategies that require investigation. Second, understanding the specific characteristics of TB patients in regional settings like Kuningan Regency is essential for developing localized, context-appropriate interventions (Cadena et al., 2017; Oxlade & Murray, 2012; Siroka et al., 2016). Third, with the national goal of achieving TB-free Indonesia by 2030, there is an urgent need for comprehensive baseline data to monitor progress and identify priority areas for intervention. Fourth, the COVID-19 pandemic has significantly disrupted TB services globally, and understanding post-pandemic TB epidemiology is crucial for recovery planning. Finally, identifying high-risk populations through demographic and clinical characterization enables targeted prevention and early detection efforts, which are key to breaking the transmission chain.

Several studies have investigated TB characteristics in various Indonesian settings, providing important context for this research. A study by Konde et al. (2020) at Tuminting Primary Health Center in Manado found significant associations between age, nutritional status, and housing density with pulmonary TB occurrence, highlighting the multifactorial

nature of TB risk. Their research demonstrated that productive age populations (19-59 years) had higher TB prevalence due to increased mobility and occupational exposures.

Research by Nisak et al. (2024) in Aceh Besar Regency identified risk factors for pulmonary TB including close contact with TB patients, cigarette consumption, and environmental factors. Their findings emphasized the importance of behavioral and environmental interventions in TB control programs. Similarly, Rahmawati et al. (2023) investigated TB in productive age populations at Pasar Minggu Primary Health Center in Jakarta, finding that factors such as knowledge about TB, housing conditions, and healthcare access were significantly associated with TB occurrence.

Regarding gender differences, Tarno et al. (2022) conducted research in Indramayu Regency during the COVID-19 pandemic and found that male gender and smoking habits were strongly associated with pulmonary TB diagnosis. Their study also highlighted the impact of pandemic-related healthcare disruptions on TB case detection. Zulfa and Prihartono (2023) characterized TB patients in Bandung City and found that males, productive age groups, and those with low socioeconomic status were disproportionately affected.

Research on TB-HIV coinfection by Laksono and Agrietia (2024) demonstrated that coinfected patients experience worse treatment outcomes and higher mortality rates compared to TB patients without HIV. They emphasized the need for integrated TB-HIV services to improve patient outcomes.

However, these previous studies have primarily focused on urban or specific regional contexts, and comprehensive data on TB characteristics in Kuningan Regency, particularly at the hospital level, remain limited. Furthermore, most studies have not specifically examined the distribution of clinical versus bacteriological TB or the proportion of comorbidities such as DM and HIV in recent years.

This study provides novel contributions in several aspects. First, it offers the most recent comprehensive characterization of pulmonary TB patients at RSUD 45 Kuningan in 2023, providing updated epidemiological data in the post-pandemic era. Second, it specifically examines the distribution of clinical versus bacteriological TB cases, which is important given the 2021 changes in TB diagnostic algorithms in Indonesia. Third, it provides detailed analysis of TB with comorbidities (DM and HIV) in a regional hospital setting, which is crucial for integrated disease management. Fourth, this research fills a knowledge gap regarding TB characteristics in Kuningan Regency, which has been identified as a high-burden area for both TB and HIV in West Java. Finally, the findings will serve as baseline data for monitoring progress toward TB elimination targets specific to this region.

The primary objective of this research is to determine the comprehensive characteristics of pulmonary TB patients at RSUD 45 Kuningan in 2023, including age distribution, gender, type of pulmonary TB (clinical vs. bacteriological), treatment history, HIV coinfection status, and DM comorbidity.

The benefits of this research are multifold. From a theoretical perspective, it contributes to the body of knowledge on TB epidemiology in Indonesia and provides evidence for understanding TB burden in regional settings. From a practical standpoint, the findings will inform hospital management and local health authorities in developing targeted TB control

strategies, allocating resources efficiently, and identifying priority populations for screening and prevention programs.

The implications of this research extend to several stakeholders. For healthcare providers at RSUD 45 Kuningan, the findings will enhance understanding of their TB patient population and inform clinical decision-making. For the District Health Office, the data will support evidence-based policy development and program planning for TB control. For the Ministry of Health, this research contributes to national TB surveillance and monitoring of progress toward elimination targets. Finally, for the community, improved TB control strategies based on this research will ultimately reduce TB transmission and improve health outcomes.

To support the success of Indonesia's and global goals in achieving significant reduction in TB incidence by 2030, and to realize a healthy, productive, independent, and just society through the Ministry of Health's mission to strengthen quality health services reaching the entire Indonesian population, this research aims to provide comprehensive characterization of TB patients at RSUD 45 Kuningan. The findings will contribute to evidence-based strategies for achieving TB-free Indonesia by 2030 and inform targeted interventions for high-risk populations in Kuningan Regency.

## METHOD

This study employed a descriptive observational research design using a retrospective approach. Descriptive observational studies are appropriate for characterizing disease patterns and identifying the distribution of health conditions in a defined population without manipulating variables or establishing causality. This design allows for comprehensive profiling of pulmonary TB cases and provides valuable epidemiological data for public health planning.

The research was conducted at RSUD 45 Kuningan, a regional public hospital in Kuningan Regency, West Java, Indonesia. RSUD 45 Kuningan serves as a referral center for TB diagnosis and treatment in the region, making it an appropriate setting for studying TB characteristics. The study period covered January 2023 to December 2023, providing a complete annual picture of TB cases and accounting for seasonal variations in disease incidence.

The study population consisted of all Pulmonary TB patients diagnosed and registered at RSUD 45 Kuningan during the study period (January to December 2023). The sampling method utilized was total sampling (census), whereby all members of the population who met the inclusion criteria were included in the study. This approach eliminates sampling bias and provides comprehensive data on all TB cases at the facility during the study period.

Inclusion criteria were: (1) patients diagnosed with pulmonary TB according to national TB diagnostic guidelines, either bacteriologically confirmed or clinically diagnosed; (2) patients registered and receiving treatment at RSUD 45 Kuningan; (3) diagnosis made between January 1, 2023, and December 31, 2023; and (4) complete medical records available for data extraction. Exclusion criteria were: (1) patients with extrapulmonary TB only; (2) incomplete medical records with missing key data; and (3) patients who were referred from or transferred to other facilities without complete documentation at RSUD 45 Kuningan.

Data were collected from secondary sources, specifically medical records of pulmonary TB patients at RSUD 45 Kuningan. The medical records provided comprehensive information including patient demographics (age, gender), type of TB diagnosis (clinical vs. bacteriological), treatment history classification (new case, relapse, treatment after default, treatment failure), HIV coinfection status, and comorbid conditions, particularly diabetes mellitus.

The data collection process involved systematic review of medical records using a standardized data extraction form developed specifically for this study. The extraction form included variables of interest based on the national TB program indicators and research objectives. Data collection was performed by trained researchers following standard procedures to ensure consistency and accuracy. Data quality was ensured through double-checking and verification of extracted information against source documents.

Data analysis was performed using descriptive statistics. Collected data were first cleaned, coded, and put into a database using Microsoft Excel. Subsequently, data were analyzed to calculate frequency distributions and percentages for each variable of interest. The analysis focused on describing the distribution of pulmonary TB cases according to age groups, gender, type of TB (clinical vs. bacteriological), treatment history categories, HIV coinfection status, and DM comorbidity status.

Results are presented in tabular form with frequencies and percentages to provide clear visualization of the distribution patterns. Age was categorized into five groups: <5 years, 5-9 years, 10-18 years, 19-59 years (productive age), and >60 years (elderly). Treatment history was classified according to national TB program definitions: new cases, relapse cases, treatment after default, and treatment failure cases. All analyses were performed in accordance with national TB surveillance guidelines to ensure comparability with national data.

This research received ethical approval from the Health Research Ethics Committee (KEPK) with approval No.52/EC/FKUGJ/V/2025, ensuring that the study adheres to ethical principles including respect for persons, beneficence, and justice. The research protocol was reviewed to ensure protection of patient confidentiality and appropriate use of medical records data.

Furthermore, this research obtained necessary permissions from multiple authorities: the Political and National Unity Agency (KESBANGPOL) of Kuningan Regency with letter number 072/259/Tahbang/2024, which granted permission for conducting health research in Kuningan Regency; the Central Statistics Agency (BPS) of Kuningan Regency with letter number B-440/32080/HM.310/2024, ensuring coordination with local statistical authorities; and permission to conduct research at RSUD 45 Kuningan with letter number 037/KEP/6/2024, which provided institutional approval and access to medical records while maintaining patient confidentiality protocols.

Patient confidentiality was strictly maintained throughout the research process. All data were de-identified, and no personally identifiable information was recorded or reported. Medical records were accessed only by authorized research personnel, and data were stored securely. The research findings are presented in aggregate form only, ensuring that individual patients cannot be identified from the published results.

## RESULT AND DISCUSSION

### Age

**Table 1. Age Distribution**

| Age | Frequency | Percentage |
|---|---|---|
| <5 | 4 | 5,0 |
| 5-9 | 2 | 2,5 |
| 10-18 | 8 | 10,0 |
| 19-59 | 50 | 62,5 |
| >60 | 16 | 20,0 |
| Total | 80 | 100 |

Based on table 1, the distribution of pulmonary TB patients aged 19-59 years is 50 people (62.5%).

### Gender

**Table 2.** Distribution of Pulmonary TB Patients by Gender

| Gender | Frequency | Percentage |
|---|---|---|
| Male | 53 | 66,3 |
| Women | 27 | 33,8 |
| Total | 80 | 100 |

The distribution of pulmonary TB patients was highest in patients with male gender, namely 53 people (66.3%), while female sex was 27 people (33.8%).

### Pulmonary TB Type

**Table 3. Distribution of Pulmonary TB Patients by Type of Pulmonary TB**

| Pulmonary TB Type | Frequency | Percentage |
|---|---|---|
| Bacteriologist | 29 | 36,3 |
| Chinese | 51 | 63,7 |
| Total | 80 | 100 |

A total of 80 patients were diagnosed with Pulmonary TB at RSUD 45 Kuningan Regency, 51 patients were diagnosed with Clinical Pulmonary TB, and 29 other patients were diagnosed with Bacteriological Pulmonary TB. The highest percentage was obtained in clinical pulmonary TB which was 63.8%, then bacteriological pulmonary TB amounted to 36.3%.

### Pulmonary TB Treatment History

**Table 4. Distribution of Pulmonary TB Patients by Pulmonary TB Treatment History**

| Pulmonary TB Treatment History | Frequency | Percentage |
|---|---|---|
| New | 76 | 95 |
| Relapse | 3 | 3,8 |
| Stop seeking treatment | 1 | 1,3 |
| Fail | 0 | 0 |
| Total | 80 | 100 |

The highest distribution of pulmonary TB patients based on treatment history was in new cases, namely 76 people (95%), then relapsed as many as 3 people (6.3%), finally discontinued treatment as many as 1 person (1.3%), and no patients failed (0%).

## Pulmonary Tuberculosis with HIV Coinfection

**Table 5. Distribution of Pulmonary TB Patients by HIV Comorbidities**

| HIV | Frequency | Percentage |
|---|---|---|
| HIV Positive | 12 | 15 |
| HIV Negative | 68 | 85 |
| Total | 80 | 100 |

As many as 15% or 12 pulmonary TB patients at RSUD 45 Kuningan Regency had HIV co-infection, and 68 other people (85%) did not have HIV coinfection.

## Pulmonary Tuberculosis with Comorbid DM

**Table 6. Distribution of Pulmonary TB Patients by Comorbid DM**

| DM | Frequency | Weights |
|---|---|---|
| With DM Comorbidities | 2 | 2,5 |
| No DM Comorbidities | 78 | 97,5 |
| Total | 80 | 100 |

Based on table 6, 78 people (97.5%) were pulmonary TB patients who did not have comorbid DM, and 2 other people (2.5%) had comorbid DM.

## Discussion

### Age

In the results of the existing data, it was found that there were more pulmonary TB patients aged 19-59 years, namely 50 patients (62.5%). This research is in line with research conducted by Konde and Asrifudin found that adults generally spend more time working and doing activities so that rest time is reduced, causing a decrease in immunity. In addition, in the study by Nisak, Fahdhiene and Ichwansyah, it was stated that close contact with TB patients, and cigarette consumption was related to the incidence of adult pulmonary TB. Adulthood is the productive age, as defined by the Ministry of Health regarding adulthood which is in the age range of 19 to 59 years. Sunarmi and Kurniawaty stated in their study that there is a relationship between productive age and the incidence of pulmonary TB, this is because productive age spends more time working with high mobility, resulting in reduced rest time (Konde et al., 2020; Nisak et al., 2024; Sunarmi & Kurniawaty, 2022; Sunarmi & Kurniawaty, 2022).

### Gender

Men are the most common gender who experience cases of Pulmonary TB at RSUD 45 Kuningan Regency. The number of male patients in the case of Pulmonary TB is 53 patients, the number of patients of Pulmonary TB is dominated by men in accordance with the WHO report that men experience more cases of Pulmonary TB than women. This case occurs due to the risk factors of men who have a smoking habit that increases the incidence of Pulmonary TB, and research by Tarno, Wahyuniar L, Iswarawanti D, Mamlukah also states that smoking is a risk factor for the occurrence of Pulmonary TB. Smoking can disrupt the clarity of mucosal secretions, which are the body's main defense mechanism against infection, thereby increasing the risk of pulmonary TB. This is due to the results of the survey showing that many male respondents often leave the house to work, such as in markets, factories, and other outdoor activities. The high frequency of leaving the house allows the transmission of pulmonary TB

(Rahmawati, A. N., et al., 2023; Rahmawati, A. N., et al., 2023; Tarno et al., 2022; World Health Organization [WHO], 2023; Zulfa & Prihartono, 2023).

**Pulmonary TB type**

From the results of the research conducted, it was found that Pulmonary TB patients were more diagnosed with clinical pulmonary TB than bacteriological patients with the number of clinical pulmonary TB which was 51 cases (63.7%) while for bacteriological pulmonary TB there were 29 cases (36.3%). The number of cases of clinical Pulmonary TB at RSUD 45 Kuningan Regency is one of the reasons because the TCM examination obtained negative results with positive X-ray photo results, therefore Pulmonary TB is still classified as Clinical Pulmonary TB based on changes in the Tuberculosis Diagnosis Flow in Indonesia in 2021(Kementrian Kesehatan RI, 2021).

There are several factors regarding why Pulmonary TB patients are more diagnosed with clinical Pulmonary TB, this depends on how quickly the patient comes to a health care facility to check his complaints. Patients who arrived at the TB facility ≥2 weeks after the onset of TB symptoms showed increased bacteriological positivity compared to those who arrived earlier. Symptoms such as coughing, bloody phlegm, cavities on chest X-rays, and infected bilateral lung lobes are all associated with bacteriological TB results (Zhang et al., 2020).

In addition, some patients find it difficult to expel phlegm, or in pediatric patients it is usually difficult to expel phlegm for bacteriological examinations, therefore X-rays are an option to enforce the diagnosis of Pulmonary TB (Kementrian Kesehatan RI, 2016).

**Pulmonary TB Treatment History**

The results of the existing data collection found that the most cases of Pulmonary TB patients based on treatment history were dominated by patients with the category of new cases, namely 76 people (95%), then relapsed as many as 3 people (6.3%), finally 1 person (1.3%) stopped treatment, and no patients failed (0%).

Varela, said that the previous history of TB treatment was related to the absence of follow-up or poor adherence to treatment (Varela et al., 2023).

Therefore, it is important to know the history of TB treatment because it can help identify patients who are at lower risk of succeeding in TB treatment. Thus, appropriate follow-up strategies and adherence to treatment can be applied (Varela et al., 2023).

**Pulmonary tuberculosis with HIV coinfection**

Kuningan Regency is one of the districts with the largest contributor of HIV cases in West Java, in the last 5 years Kuningan Regency has also increased in the last 5 years, therefore the discovery of Pulmonary TB cases with HIV at RSUD 45 Kuningan was recorded as many as 12 cases or 15% of the total cases of Pulmonary TB at RSUD 45 Kuningan Regency.

Although the discovery of cases of Pulmonary TB with HIV coinfection is not too many, this case must still be treated seriously, because based on Ade and Agrietia research, it is stated that Pulmonary TB and HIV are diseases that will affect each other and can worsen the condition of patients who experience Pulmonary TB with HIV coinfection. In addition, patients with rapid HIV coinfection experience worsening due to a decrease in the immune system which causes an increase in the mortality rate of Pulmonary TB (Laksono & Agrietia, 2024; Laksono & Agrietia, 2024).

**Pulmonary Tuberculosis with Comorbid DM**

Diabetes mellitus is one of the factors that contribute to the high incidence of infectious diseases, including pulmonary tuberculosis. Based on the discovery of Pulmonary TB cases at 45 Kuningan Hospital, out of 80 patients, only 2 patients (2.5%) had a history of DM, who were subsequently diagnosed with Pulmonary TB with comorbid DM. The number of cases of DM patients receiving services in Kuningan Regency in 2023 was 11584 cases, an increase of almost 2 times compared to 2022 which was only 680 cases.

Quoting from Jeon et al., damage to immune cell function and body defenses is the cause of the increased incidence of pulmonary TB with comorbid DM(16) In addition, according to Workneh et al.elderly patients are prone to having pulmonary TB with comorbid DM as a result of decreased immune function.also Nazulis explained that with age, pancreatic cell function and insulin secretion can decrease and cause hyperglycemia conditions that are difficult to control.

## CONCLUSION

This study characterizes pulmonary tuberculosis (TB) cases at RSUD 45 Kuningan in 2023, showing a profile dominated by males (66.3%) in the productive age group of 19–59 years (62.5%), with most cases newly diagnosed (95%) and clinically classified (63.7%) rather than bacteriologically confirmed. Comorbidities included HIV coinfection in 15% of cases and diabetes mellitus (DM) in 2.5%, highlighting TB's burden among working-age males and its overlap with HIV, which aligns with local trends and underscores the need for targeted control efforts to achieve a TB-free Indonesia by 2030. For future research, analytical or mixed-methods studies should investigate determinants of high male and productive-age prevalence, diagnostic pathways for clinical versus bacteriological classifications per national guidelines, longitudinal treatment outcomes especially in TB-HIV coinfection, and the true DM comorbidity rate amid potential screening gaps, to refine integrated TB strategies.

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