



Demographic Profile of Drug-Resistant Tuberculosis Patients

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Article Info

Article history:

Received 19 February 2025

Received in revised form 22

March 2025

Accepted 8 May 2025

Keywords:

Drug-Resistant Tuberculosis

Demographic Epidemiology

Public Health

Infection Control

Abstract

Drug-Resistant Tuberculosis (DR-TB) represents a significant global health challenge with complex treatment and control issues. In Bekasi Regency, a metropolitan area with high population density, DR-TB incidence shows an increase requiring special attention. This study aims to identify the demographic profile of DR-TB patients to understand disease distribution characteristics and design appropriate management strategies. A descriptive study conducted at Bekasi Regency Hospital from October 2022 to October 2024. Data collected through MDR-TB outpatient medical records identified via Molecular Quick Test. Variables studied included age, gender, district of residence, and education level. Data analyzed using descriptive statistics and presented in tables, diagrams, and graphs. Among 338 DR-TB patients, the majority were aged 41-50 years (27.1%), with male patient dominance (61.5%). Tambun Selatan District had the highest cases (16.9%), with a population density of 10,063 people/km². Most patients were high school graduates (74.3%), with 89.6% originating from Bekasi Regency. The demographic profile of DR-TB patients at Bekasi Regency Hospital shows patterns similar to general tuberculosis cases. Tambun Selatan District exhibits the highest spread risk, indicating the need for targeted interventions in DR-TB prevention and control.

Introduction

Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis* that attacks various human organs. The Centers for Disease Control and Prevention (CDC) said archaeologists found the bacterium *Mycobacterium tuberculosis* on the bodies of a 9,000-year-old mother and child buried together in the ancient city of Yam near Israel. Other data also recorded the discovery of *M. tuberculosis* germs in India (3300 years ago) and China (2300 years ago). This shows that since thousands of years ago, tuberculosis has been suffered by humans in various parts of the world (Direktorat Jenderal Pencegahan dan Pengendalian Penyakit. Direktorat Pencegahan dan Pengendalian Penyakit Menular, 2023). According to the World Health Organization, 2023, in 2022, tuberculosis cases infected up to 10.6 million people worldwide, more than the previous year (World Health Organization, 2023). In the same year, the incidence rate (IC) of new cases of tuberculosis occurred as much as 133 per 100,000 world population. Meanwhile, in Indonesia, the IC of new cases of tuberculosis reached 385 per 100,000 population. The Government of Indonesia participates in the global commitment of the "End TB Strategy" and has a "Roadmap for the Elimination of Tuberculosis in Indonesia 2020-2030". In the document, it is stated that the target of reducing the incidence of tuberculosis is close to 65 cases per 10,000 population by 2030. One of the five key interventions of the program is "Increasing resource investment to strengthen tuberculosis services so as to improve the success of treatment of sensitive and drug-resistant

tuberculosis" (Kementerian Kesehatan Republik Indonesia, 2020; Saktiawati et al., 2024; Matteelli et al., 2016).

Drug-resistant tuberculosis (RO TB) is a significant challenge in TB control efforts around the world, especially in developing countries, including Indonesia (Badan Pusat Statistik Provinsi Jawa Barat, 2023; Wulandari et al., 2024; Handayani et al., 2024; Nugroho & Sasanti, 2025). Bekasi Regency, which is within the scope of the Jakarta metropolitan area, faces special challenges in overcoming TB, exacerbated by the increase in the incidence of TB RO. This form of resistant TB significantly challenges the effectiveness of conventional anti-TB treatment regimens, leads to the need for more complex and prolonged therapy, and results in a worse prognosis for patients (Doe et al., 2020; Müller et al., 2018; Nair et al., 2016; Whittaker et al., 2019; World Health Organization, 2023). RO TB strains increase the complexity of TB control for several key reasons. First, this resistance makes TB strains no longer responsive to Rifampicin, one of the most effective and most commonly used drugs in the treatment of TB. Another form of TB RO, Multidrug Resistant Tuberculosis (MDR-TB), has increasingly complex resistance due to resistance to at least Rifampicin and Isoniazid, two of the most effective drugs in the standard TB treatment regimen (Borah et al., 2021; Monde et al., 2023). Because of this resistance, treatment becomes much more difficult, requires a combination of more expensive second-line drugs, has more serious side effects, and must be used for a longer period of time, usually 18–24 months or more (Kementerian Kesehatan Republik Indonesia, 2020; Nair et al., 2016; Rossi et al., 2021; Otto-Knapp et al., 2024).

In addition, the increase in TB RO cases requires stronger surveillance systems, more sophisticated and expensive diagnostics, and stricter patient isolation and treatment to prevent further transmission (Al-Worafi, 2023; Engel et al., 2022; Shah et al., 2024). All of this requires significant resources and effective coordination in the health system (Kementerian Kesehatan Republik Indonesia, 2020; Suman et al., 2023). In the context of Bekasi Regency, which is an area with high population density and high mobility near the capital city, this challenge becomes more urgent. The effectiveness of TB prevention and control strategies is highly dependent on the ability to quickly identify, isolate, and treat cases of TB RO, as well as conduct effective contact tracing to prevent further spread (Kementerian Kesehatan Republik Indonesia, 2020; Reddy et al., 2010; Shah et al., 2024).

Based on the complexity of the problem, this study aims to identify the demographic profile of Drug-Resistant Tuberculosis (TBRO) patients at the Regional General Hospital (RSUD) of Bekasi Regency. Through demographic studies, it is hoped that a comprehensive understanding of the characteristics of the spread of TBRO in the region can be obtained, which can further serve as a basis for developing more effective management strategies (Rahman et al., 2022).

Methods

This study uses a descriptive design that aims to describe the demographic profile of drug-resistant tuberculosis (TB RO) patients at the Regional General Hospital (RSUD) of Bekasi Regency. The data used in this study is secondary data taken from the medical records of outpatients at the MDR-TB POLY of Bekasi Regency Hospital. Data collection was carried out at the Bekasi Regency Hospital during the research period from September to December 2024. The data used included patients undergoing treatment at MDR-TB outpatient polyclinics from October 2022 to October 2024. The study population consisted of all patients who had been diagnosed with TB RO based on the results of the Molecular Rapid Test (TCM) examination at the MDR-TB poly of Bekasi Regency Hospital during that period. From this population, total sampling was carried out, that is, all patients who met the inclusion criteria were included in the study. With this method, all patients who have complete data related to the research variables, such as age, gender, place of residence, and last education level, become part of the research sample. This study examines several variables, namely patient demographic

variables which include age, gender, last education level, and location of residence. Relevant data was collected from the patient's medical records at the Bekasi Regency Hospital. The data collection procedure is carried out by accessing the medical record archives of patients who have been identified as TB RO through TCM examinations at the MDR-TB poly. The data collected were then recapitulated to obtain a comprehensive picture related to the demographic profile of TB RO patients. Data analysis was carried out using a descriptive statistical approach. The results of the analysis are presented in the form of tables, diagrams, and graphs to facilitate interpretation. The data collected was analyzed to identify age distribution, comparison by gender, geographical distribution based on sub-district of residence, and the patient's last education level (Ambaw et al., 2018).

Result and Discussion

This study successfully collected data from 338 patients with drug-resistant tuberculosis (TB RO) who underwent treatment at the MDR-TB poly of Bekasi Regency Hospital during the period of October 2022 to October 2024. In this period, the total number of outpatient visits reached 3889 visits, which shows that most patients make revisits as part of treatment. From the age distribution analysis, the majority of TB RO patients are in the age range of 41–50 years, which includes 92 patients (27.1%). This age group was followed by the age group of 31–40 years (20.4%) and 51–60 years (20.1%). The age group with the lowest number of patients is 70–80 years old (0.9%). The youngest age was recorded at 16 years old, while the oldest age was 75 years old.

Tabel 1. Number of TB RO Patients by Age Range

Age Range	Sum	Percentage (%)
11-20 Th	15	4,4
21-30 Th	67	19,8
31-40 Th	69	20,4
41-50 Th	92	27,1
51-60 Th	68	20,1
61-70 Th	24	7,1
70-80 Th	3	0,9
Total	338	100

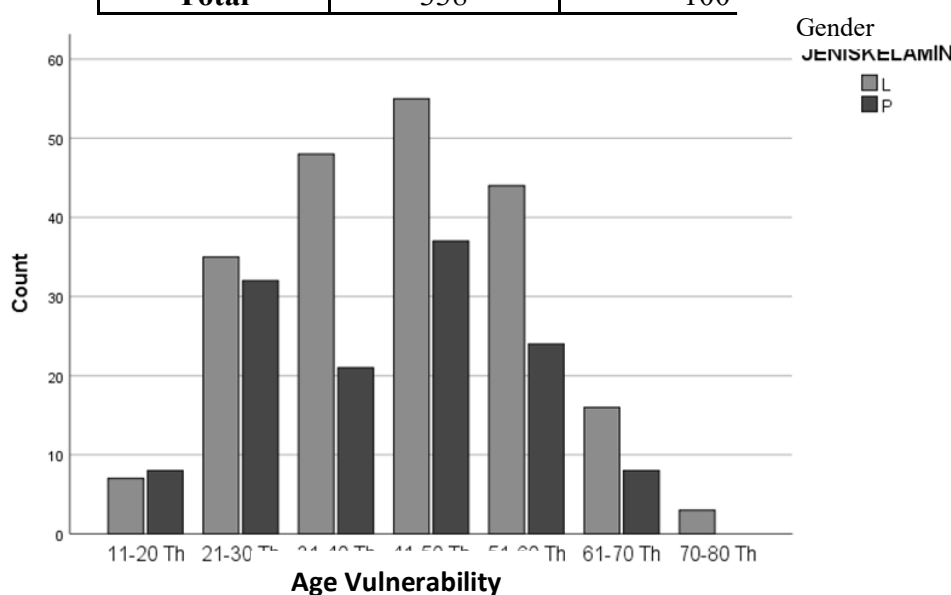


Figure 1. TB RO Patients By Sex

The distribution of TB RO cases shows significant variation among sub-districts in Bekasi Regency. South Tambun District recorded the highest number of cases, namely 16.9% of the total patients, followed by North Cikarang District (10.9%) and Karang Bahagia District (7.4%). In addition, there were 35 patients (10.4%) who came from outside Bekasi Regency. Of the patients outside the region, the largest number came from Bekasi City (5.9%).

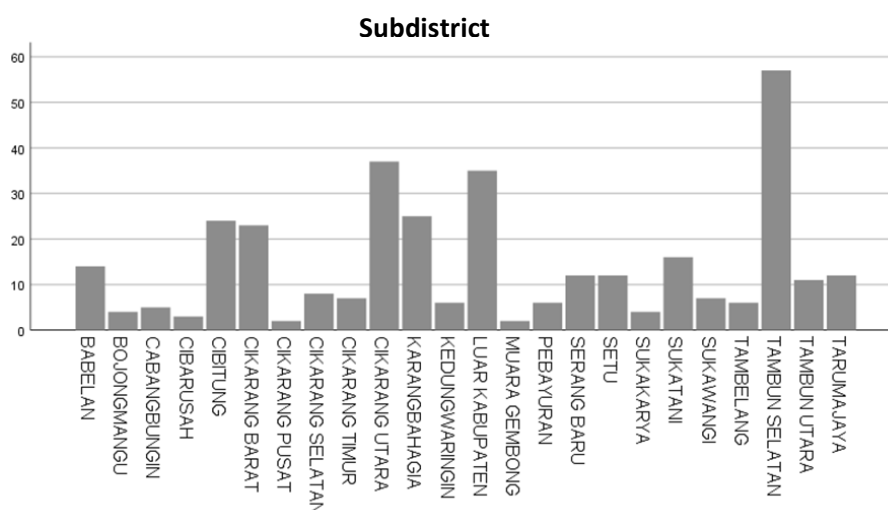


Figure 2. Number of RO TB Patients by District

Most of the TB RO patients have the last level of high school education or equivalent, with a total of 251 patients (74.3%). Other groups include patients who have graduated from elementary school or equivalent (13%), graduated from junior high school or equivalent (8.9%), Diploma III (0.9%), Strata I (1.5%), and Strata II (0.3%). A total of 4 patients (1.2%) were recorded as having not completed elementary school education.

Table 2. Number of TB RO Patients by Education Level

Regency	Sum	Percentage (%)
Regency Banyumas	2	0.6
Regency Bekasi	303	89.6
Regency Bogor	1	0.3
Regency Ciamis	1	0.3
Regency Indramayu	1	0.3
Regency Kebumen	1	0.3
Regency Kuningan	1	0.3
Regency Tangerang	1	0.3
Regency Tegal	1	0.3
City Bekasi	20	5.9
City Jakarta Pusat	2	0.6
City Jakarta Selatan	1	0.3
City Jakarta Timur	1	0.3
City Jakarta Utara	2	0.6
Total	338	100

In the period from October 2022 to October 2024, there were 338 outpatients with RO TB who were treated at the MDR-TB poly of Regency Bekasi Hospital. Almost all TB RO patients underwent outpatient treatment more than once in this time span so that the total number of outpatient visits reached 3889 during this period. In 2023, Regency Bekasi has 11,259.12 TB cases found in Bekasi Regency Hospital in 2023 There are around 128 RO TB patients who are treated at the MDR-TB poly of Regency Bekasi Hospital in 2023, so that the cases of RO

TB patients who are treated at the MDR-TB poly of Regency Bekasi Hospital will reach 1.1% of the total TB case findings in Regency Bekasi in 2023.

Data shows that the most RO TB patients are in the age range of 41 - 50 years. The youngest age is 16 years old and the oldest is 75 years old. Based on gender, it appears that the number of male sex is higher (61.5%) compared to female sex during this time period. These two data are in accordance with the Ministry of Health's report related to the TB control program in 2022, namely new TB cases are dominated by men (57.8%), and the age group with the most sufferers is in the age range of 45 - 54 years (Directorate General of Disease Prevention and Control, Directorate of Prevention and Control of Infectious Diseases, 2023). Thus, it appears that new tuberculosis cases and RO TB cases have almost the same pattern. Most of the RO TB patients who went to the MDR-TB poly at Regency Bekasi Hospital had a high school education background (74.3%) followed by patients with elementary school education and junior high school education (Direktorat Jenderal Bina Upaya Kesehatan Direktorat Jenderal Pengendalian Penyakit dan Kesehatan Lingkungan, 2012).

Of the 23 sub-districts in Regency Bekasi, the highest cases of TB RO were found in patients domiciled in South Tambun District (16.9%), North Cikarang District (10.9%), and Karang Bahagia District (7.4%). Based on data from the Population and Civil Registration Office of Bekasi Regency in 2023, South Tambun District has the largest population (13.6%) and the highest population density (10,063 people/km²) compared to other sub-districts (Dinas Kependudukan dan Pencatatan Sipil Kabupaten Bekasi, 2024). This high population density is one of the risk factors for the spread of TB RO cases. With the high number of cases of RO TB domiciled in South Tambun district, the risk of the spread of drug-resistant *M. tuberculosis* germs will also increase. Measures to prevent the spread of RO TB infection are needed, including counseling to the community to increase awareness and understanding of tuberculosis infection, and optimizing the early detection program of tuberculosis cases in the area (Johnston et al., 2022; Vigenschow, 2019).

Some of the challenges in the implementation of the RO TB control program in Bekasi include high population density in areas with the highest case rates, such as South Tambun District, which contributes to the spread of the disease. In addition, other challenges are limited resources in terms of medical personnel, health facilities, and access to second-line drugs that are more expensive and have more severe side effects than regular TB treatment (Prasad et al., 2021; Harries et al., 2020). The patient's adherence factor to long-term treatment (18–24 months) is also a major obstacle, as non-compliance can lead to increased resistance and further transmission. Regulations and policies that are not yet uniform at the local level can also hinder the effectiveness of programs in dealing with TB cases more broadly.

This research is in line with the National Strategy for Tuberculosis Control in Indonesia 2020-2024 which aims to reduce the incidence rate of TB to 65 per 100,000 population by 2030. The findings in this study confirm that one of the main strategies, namely "optimization of promotion and prevention, as well as improved infection control," is very relevant, especially in areas with high population density such as Bekasi. In addition, the study supports national initiatives in strengthening resource investment in TB services as well as accelerating the adoption of advanced diagnostic technologies such as TCM. Thus, the results of this study can be a reference for the development of more effective RO TB prevention policies and programs at the regional and national levels (Kementerian Kesehatan Republik Indonesia, 2020). Several innovations can increase the impact of this research in the context of the prevention and control of RO TB. One of them is the use of digital technology for monitoring patient adherence to treatment, such as mobile applications that remind patients to take medication regularly and allow healthcare workers to monitor patient progress in real-time. Another innovation is the strengthening of data-based surveillance systems to map areas with the highest incidence of TB RO, so that interventions can be more targeted and effective. In addition, the development

of nanoparticle-based therapies, as has been researched by Suman et al. (2023), can be a solution in improving the effectiveness of RO TB treatment by reducing side effects and duration of treatment. If these innovative strategies are implemented, this research will be even more relevant and have a greater impact in supporting public health policies in Indonesia.

Conclusion

The demographic profile of RO TB patients who are treated at the MDR-TB polyclinic of Regency Bekasi Hospital shows a similar pattern to TB patients in general, especially in the age and gender distribution. The most cases occurred in the age range of 41-50 years and were more experienced by men (61.5%). In addition, South Tambun District recorded the highest number of cases (16.9%), which reflects the high risk of transmission in the region, supported by the population density factor. Most patients have a high school education background, which may affect their understanding of the importance of proper and thorough treatment. Efforts to prevent and control TB RO require comprehensive interventions, including public education about the dangers of TB RO, the importance of early detection, and optimization of treatment and case reporting systems. Rapid molecular examinations must continue to be utilized to support accurate and efficient diagnosis. Only with an integrated approach can the target of reducing the incidence of drug-resistant tuberculosis be achieved sustainably.

Acknowledgments

The author would like to thank all parties who have helped in the process of completing this research.

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