

Original research article

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Demographic Characteristics of MDR TB Patients Managed with BPaLM Regimen at Raden Mattaher General Hospital Jambi Period February-September 2024

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ABSTRACT

Background: Multidrug-resistant tuberculosis (MDR-TB) remains a major global and national health challenge. Indonesia has implemented the new BPaLM treatment regimen, which offers a shorter duration and fewer medications compared with previous regimens, thereby aiming to improve treatment outcomes. RSUD Raden Mattaher Jambi is one of the MDR-TB referral centers in Jambi Province applying this regimen. **Objective:** This study aims to describe the characteristics of MDR-TB. **Methods:** Total sampling was used to include all MDR-TB patients who initiated BPaLM therapy from February to September 2024, resulting in 17 eligible subjects. Data were collected from medical records and the National Tuberculosis Information System (SITB). **Results:** The findings showed that most patients were male (82.4%) with an average age of 42 years. The majority were employed, underweight, and 52.9% had a history of smoking. **Conclusion:** In conclusion, MDR-TB patients treated with the BPaLM regimen were predominantly male, of productive age, mostly employed, underweight, and had a history of smoking.

Keywords: MDR TB; BPaLM treatment; Characteristics

INTRODUCTION

Tuberculosis is a communicable public health problem and ranks as the second leading cause of death worldwide, caused by infection with *Mycobacterium tuberculosis*. The highly complex structure of the bacterial cell wall confers acid-fast properties, enabling the organism to survive in diverse environmental conditions. Tuberculosis is clinically classified into two forms: pulmonary tuberculosis, which represents the most common manifestation, and

extrapulmonary tuberculosis.¹ The primary source of transmission of pulmonary tuberculosis is patients with positive acid-fast bacilli (AFB) smear results. When infected individuals cough or sneeze, *M. tuberculosis* is expelled into the air in the form of droplets. Infection occurs when these droplets are inhaled and enter the respiratory tract.² Patients with AFB-positive tuberculosis pose a significantly higher risk of transmission compared to those with AFB-negative tuberculosis.³ Therefore, effective management and control of tuberculosis remain critical in Indonesia to reduce morbidity and mortality associated with the disease and to achieve tuberculosis elimination targets, including a 95% reduction in TB-related deaths by 2030 and a TB-free status by 2050.

According to data from the World Health Organization (WHO) Global Tuberculosis Report 2025, an estimated 8.3 million new cases of tuberculosis were reported globally in 2024. Indonesia remains among the eight countries with the highest tuberculosis burden worldwide.⁴

Multidrug-resistant tuberculosis (MDR-TB) is defined as resistance to at least isoniazid and rifampicin, the two most effective first-line anti-tuberculosis drugs.⁵ Globally, the estimated annual number of individuals with multidrug-resistant tuberculosis (MDR-TB) remained relatively stable between 2020 and 2022, with an estimated 410,000 cases in 2022. In Indonesia, 11,833 MDR-TB cases were laboratory confirmed in 2022, of which 7,745 patients had initiated treatment.⁶ These challenges have prompted updates to treatment regimens for rifampicin-resistant tuberculosis (RR-TB) patients, including the adoption of the BPaLM regimen, which consists of bedaquiline, pretomanid, linezolid, and moxifloxacin administered for 26–39 weeks. Operational research conducted among RR-TB patients since July 2022 demonstrated a treatment success rate of 97.3%.⁷

The use of the BPaLM regimen is expected to reduce the rate of treatment discontinuation and improve treatment success rates due to its substantially shorter treatment duration and reduced pill burden. Therefore, this study aims to describe the characteristics of patients with multidrug-resistant tuberculosis (MDR-TB) receiving this updated treatment regimen.

METHODS

This study employed a descriptive design with both retrospective and prospective approaches to collect treatment data from the initiation of therapy through treatment completion. The study population and sample comprised all patients with multidrug-resistant tuberculosis (MDR-TB) who received the updated BPaLM treatment regimen at RSUD Raden Mattaher Jambi during the period of February–September 2024. A total of 17 patients were included based on medical record data, and total sampling was applied. The study was conducted at the Tuberculosis Clinic of RSUD Raden Mattaher Jambi. Data were obtained

from medical records and Software *Sistem Informasi TB* (Tuberculosis Information System/SITB). Prior to data collection, research approval and ethical clearance were obtained from RSUD Raden Mattaher Jambi, and the study commenced after official authorization was granted. Throughout the study process, patient confidentiality and anonymity were strictly maintained. After data collection was completed, data were analyzed using the Statistical Package for the Social Sciences (SPSS) software with univariate analysis to describe the frequency distribution of MDR-TB patient characteristics, including age, gender, occupation, smoking history, previous TB treatment and diagnosis history, comorbidities, and body mass index (BMI).

RESULTS

Based on data obtained from the medical records of patients with multidrug-resistant tuberculosis (MDR-TB) receiving the BPaLM treatment regimen at RSUD Raden Mattaher Jambi during the February–September 2024 period, involving a total of 17 patients, the results are presented in the following table:

Table 1. Demographic Characteristics of MDR-TB Patients at RSUD Raden Mattaher Jambi.

Characteristics	Frequencies (n=17)	Percentage (%)
Gender		
Male	14	82.4
Female	3	17.6
Age, years		
15-24 Years	1	5.9
25-34 Years	3	17.6
35-44 Years	6	35.3
45-54 Years	4	23.5
55-64 Years	3	17.6
>65 Years	0	0
Occupation		
Employed	14	82.4
Unemployed	3	17.6
No data	0	0
Smoking history		
Former smokers	9	52.9
Now	3	17.6
Never	5	29.4
TB treatment history		
New case	9	52.9
Relapses	8	47.1
Treated after failure of Category I regimen	0	0
Treated after failure of Category II regimen	0	0
Treated after loss to follow-up	0	0
Previously treated with unknown treatment outcome	0	0
Treated after failure of second-line treatment	0	0
Etc	0	0

Characteristics	Frequencies (n=17)	Percentage (%)
HIV/AIDS		
(+) HIV	0	0
(-) HIV	17	100
Comorbidity		
Diabetes Mellitus	2	11.8
Hypertension	0	0
Cancer	0	0
Kidney Diseases	0	0
Other lung disease	0	0
Chronic hepatitis	0	0
Epilepsy	0	0
Psychiatric problem	0	0
Etc	0	0
Without Comorbidity	15	88.2
Body Mass Index		
<18.5 kg/m ²	10	58.8
18.5-22.9 kg/m ²	7	41.2
23-24.9 kg/m ²	0	0
25-29.9 kg/m ²	0	0
≥30 kg/m ²	0	0

A total of 17 patients with multidrug-resistant tuberculosis (MDR-TB) who received the updated BPaLM treatment regimen at RSUD Raden Mattaher Jambi were included in this study (**Table 1**). Male patients predominated, accounting for 82.4% of the study population. The largest age group was 35–44 years, with a mean age of 42 years (range, 21–62 years). Most patients were employed, and former smokers constituted the largest smoking history category. Regarding treatment history, more than half of the patients were newly diagnosed, while the remainder were relapse cases. No patients had HIV comorbidity, whereas two patients (11.8%) had diabetes mellitus. In terms of nutritional status, underweight was more common than normal body mass index (BMI), with 58.8% of patients classified as underweight and 41.2% having normal BMI.

DISCUSSION

Male sex was the predominant gender in this study, which is consistent with findings reported by Setyawan et al. (2022), where males constituted the majority of tuberculosis cases.⁸ Another study by Nikmawati (2024) reported similar findings, with the study sample predominantly consisting of male patients.⁹ According to Humayun et al. (2022), this may be attributed to the fact that men generally have higher levels of social contact, are more likely to be engaged in high-risk occupations, and have higher rates of smoking behavior, all of which increase the risk of being diagnosed with tuberculosis.¹⁰

In this study, patient age was categorized into several age groups. The distribution showed that 1 patient (5.9%) was aged 15–24 years, 3 patients (17.6%) were aged 25–34

years, 6 patients (35.3%) were aged 35–44 years, 4 patients (23.5%) were aged 45–54 years, and 3 patients (17.6%) were aged 55–64 years. No patients were aged 65 years or older. Therefore, the most prevalent age group was 35–44 years, with a mean age of 42 years. These findings are consistent with those reported by Adiwinata et al. (2018), which identified the 35–44-year age group as the most affected, followed by the 45–54-year age group.¹¹ In contrast, a previous study by Fitri AD et al. (2019) reported different findings, with the study population being predominantly composed of patients aged 26–30 years.¹² According to Hutomo et al. (2024), productive age (<65 years) is associated with the occurrence of multidrug-resistant tuberculosis (MDR-TB), which is consistent with the findings of this study, in which 100% of patients were younger than 65 years. This may be explained by the fact that individuals in this age group are economically active and more likely to engage in frequent social interactions and high mobility, thereby increasing the risk of MDR-TB transmission to others and the surrounding environment.¹³ In this study, no patients were younger than 15 years. However, tuberculosis occurring in children has the potential to cause various adverse outcomes, including growth failure, disability, and even death, depending on the organs involved and the severity of the disease.¹⁴

This study also examined patient characteristics based on employment status. The results showed that the sample was predominantly composed of employed patients (82.4%), while 17.6% were unemployed. These findings are consistent with a study conducted by Bayan et al. (2022), which reported that only 4.5% of patients were unemployed.¹⁵ However, different findings were reported by Ainiyah et al. (2019), who found that unemployed patients outnumbered employed patients, accounting for 66.7% of the study population.¹⁶ The predominance of employed patients in this study may be explained by their increased likelihood of exposure in occupational settings, particularly in healthcare environments or workplaces involving frequent contact with other individuals. Additionally, individuals who were previously employed may have been exposed to and infected by patients with multidrug-resistant tuberculosis (MDR-TB).¹⁷

In this study, patient characteristics based on smoking history were categorized into three groups: former smokers, current smokers, and never smokers. Former smokers constituted the largest proportion, accounting for 52.9% of patients. These findings are consistent with a study by Shangase et al. (2025), which reported a higher proportion of patients with a history of smoking.¹⁸ This can be explained by the contribution of smoking habits to impaired respiratory mucosal function, which plays a crucial role in detecting and eliminating *Mycobacterium tuberculosis* (MTB) upon entry into the airways. Mucosal dysfunction facilitates more rapid proliferation of MTB within the host. If treatment is not conducted optimally and in a structured manner, this condition may further increase the risk of developing multidrug-resistant tuberculosis (MDR-TB).¹⁹

Based on the characteristics of tuberculosis treatment history in this study, 9 patients (52.9%) were classified as new cases, while 8 patients (47.1%) were classified as relapse cases. In contrast, a previous study by Soedarsono et al. (2023) reported that only 7 patients were newly diagnosed, whereas 426 patients (98%) had been previously treated. Among the previously treated patients, relapse cases constituted the largest proportion (160 patients; 36.9%), followed by patients treated after failure of Category I treatment (110 patients) and those treated after failure of Category II treatment (55 patients).²⁰ This finding differs from the results of the present study, which showed that the proportions of new and relapse cases were nearly equal. According to Zong et al. (2018), inadequate previous treatment may increase the risk of relapse among patients with multidrug-resistant tuberculosis (MDR-TB).²¹ Furthermore, subtherapeutic drug levels and poor adherence to medication may also contribute to the occurrence of MDR-TB relapse.²² The results of the present study contrast with previous findings, showing a predominance of newly diagnosed cases among patients.

No patients in this study had HIV comorbidity. However, individuals diagnosed with HIV have an approximately 30-fold higher risk of developing tuberculosis compared with HIV-negative individuals.²³ This statement is further supported by Quzwain F et al. (2020), who reported that the risk of developing tuberculosis is significantly higher among individuals infected with HIV.²⁴ In this study, two patients (11.8%) had comorbid diabetes mellitus, while the remaining 88.2% had no comorbid conditions. These findings are comparable to those reported by Song et al. (2023), in which 88.76% of patients had no comorbidities and 8.02% had diabetes mellitus as a comorbidity.²⁵ A previous study by Nopridayanti et al. (2025) demonstrated that MDR-TB patients were predominantly those without a history of diabetes mellitus, accounting for 78.7% of cases.²⁶ In the present study, both patients with diabetes mellitus achieved favorable treatment outcomes. Similarly, a post-hoc analysis of the STREAM clinical trial found that, although patients with diabetes experienced more serious adverse events, treatment efficacy outcomes did not differ significantly from those of patients without diabetes.²⁷⁻²⁸

Body mass index (BMI) was one of the variables assessed in this study. The results showed that a higher proportion of patients were underweight (58.8%) compared with those with normal BMI (41.2%). These findings are consistent with a study conducted by Nikmawati et al. (2024), which reported that the study sample was predominantly underweight (56.4%), while 34% of patients had normal BMI.⁹ Similarly, Dikry et al. (2024) reported that the majority of patients had a body mass index below the normal range.²⁹ Low body mass index (BMI) has been associated with a 2–2.8-fold increased risk of developing multidrug-resistant tuberculosis (MDR-TB). According to a study by Cho et al. (2022), this mechanism may be explained by protein deficiency in underweight patients, which impairs immune function and weakens host defense mechanisms against *Mycobacterium tuberculosis* infection, thereby increasing the

risk of TB disease progression.³⁰ To support rapid and accurate detection, which plays a crucial role in MDR-TB control, a review article by Unicha MS et al. (2022) summarized studies on biomarkers as potential targets for MDR-TB diagnostic testing. The review reported that a combination of soluble CD14 (sCD14), peptidoglycan recognition protein 2 (PGLYRP2), and fibrinogen alpha chain (FGA) showed potential as diagnostic biomarkers for tuberculosis, with a sensitivity of 94.7% and a specificity of 80%.³¹

CONCLUSION

Based on the characteristics of patients with multidrug-resistant tuberculosis (MDR-TB) treated with the updated BPaLM regimen at RSUD Raden Mattaher Jambi during the February–September 2024 period, involving 17 patients, the majority were male, predominantly aged 35–44 years, mostly employed, and largely underweight based on body mass index (BMI). A history of smoking was identified in 52.9% of patients. No patients had a history of HIV infection, and only two patients had comorbid diabetes mellitus.

RECOMMENDATIONS

As the implementation of the BPaLM regimen is relatively recent, future studies are recommended to extend the study period to obtain a larger sample size, thereby providing a more comprehensive description of patient characteristics.



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