

Conventional Regimen to BPAL/M : Effectiveness and Predictors of Successful Drug-Resistant Tuberculosis Therapy in South Kalimantan

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Abstract

This study aimed to analyze the comparative efficacy of conventional and BPAL/M regimens and identify predictors of treatment success in drug-resistant tuberculosis (DR-TB) patients receiving BPAL/M in South Kalimantan during the period 2022-2024. The study included 245 DR-TB patients. The Mann-Whitney test showed a significant difference in clinical outcome scores between patients receiving conventional treatment and BPAL/M treatment ($P < 0.001$), and the group of patients receiving conventional treatment had a higher probability of treatment failure compared to the group receiving BPAL/M. Predictors of treatment success in BPAL/M regimens using logistic regression showed that sex (OR = 10.772; %CI: 1.051-110.416, $P = 0.045$) was significantly associated with TB treatment success, while comorbidities such as diabetes and resistant type were not. Efforts should be made to achieve successful treatment in male patients by increasing understanding and adherence to treatment through various efforts, for example, reminders to take medication.

Keywords: sex, predictor factor, comorbid DM, treatment success, resistant pattern

Introduction

Mycobacterium tuberculosis is the primary cause of tuberculosis (TB), a contagious disease primarily affecting the airways (80%). Tuberculosis (TB) is a significant sustainable development goal (SDG) in Indonesia and globally, as it is a public health issue. As of now, tuberculosis remains the second most important cause of death, following HIV/AIDS, and ranks among the top 20 causes of mortality globally⁽¹⁾. Indonesia ranked second in the number of cases in 2022, accounting for approximately two-thirds of the global case count, closely following India. Experts anticipate that approximately 10.6 million individuals worldwide will receive a tuberculosis diagnosis in 2021⁽²⁾.

In Indonesia, the total number of tuberculosis cases recorded in 2022 was 677,464, a substantial increase from the 397,377 cases identified in 2021. The WHO identifies high-burden countries (HBC) for TB using three criteria: tuberculosis incidence, tuberculosis with HIV co-infection, and multidrug-resistant tuberculosis (MDR-TB). Every one of the three categories features Indonesia and 13 other nations on the HBC list. Indonesia faces a significant challenge in addressing tuberculosis⁽³⁾.

Drug-resistant tuberculosis (DR-TB) continues to provide a substantial obstacle to tuberculosis management and ranks among the primary public health concerns in many countries worldwide. In 2022, the nations with the highest incidence of DR-TB cases, in descending order, are India, the Philippines, the Russian Federation, Indonesia, China, Pakistan, Myanmar, and Nigeria⁽²⁾. In Indonesia, the estimated prevalence of DR-TB is 2.4% among all newly diagnosed TB patients and 13% among those who have previously had treatment, with an estimated incidence of 24,000 DR-TB cases, equating to 8.8 per 100,000 individuals in the population⁽⁴⁾. Fewer than one-third of the projected incident tuberculosis cases susceptible to DR-TB were recognized as believed DR-TB cases and subsequently subjected to testing, resulting in a diagnosis of just 9.8% (982 out of 10,065) of the estimated real DR-TB cases⁽⁵⁾.

Treatment coverage of tuberculosis cases in 2022 was 74.7%, a significant increase compared to 2021 and the highest in the last eleven years. In 2022, Indonesia did not achieve the expected treatment coverage target of 85%. South Kalimantan treatment coverage is still at 48.7%⁽¹⁾.

The low treatment coverage of tuberculosis cases can have an impact on the risk of resistant TB. The treatment success rate for patients with multidrug-resistant tuberculosis (MDR-TB) is low, at approximately 50%, when using longer treatment regimens. An extended duration of therapy is frequently associated with patient nonadherence and a loss to follow-up. Consequently, the implementation of shorter, yet efficacious and safe, treatment regimens could significantly enhance treatment outcomes for MDR/RR-TB.

In its 2022 consolidated guidelines, the World Health Organization (WHO) recommends a 6-month regimen composed of bedaquiline, pretomanid, linezolid (600 mg), and moxifloxacin (BPALM) over the 9-month or longer (typically 18-month) regimens for MDR/RR-TB. For cases with documented resistance to fluoroquinolones, the same regimen is advised but without moxifloxacin (the BPAL regimen)⁽⁶⁾. In South Kalimantan, the short-term regimen, BPALM/BPAL therapy will only be given in 2024. This study is to analyze the comparative effectiveness and identify predictive factors of treatment success between conventional regimens and BPAL/BPALM regimens in patients with Drug-Resistant Tuberculosis (DR-TB) in South Kalimantan in 2022-2024.

Materials and Methods

This observational analytic study used a retrospective cohort study. This study used a total sampling data collection technique, namely 245 drug-resistant patients in South Kalimantan. Data was taken from South Kalimantan province's Tuberculosis Information System (TB-IS) in 2022-2024, that is, demographics of patients, history of TB treatment, comorbidity with diabetes mellitus, resistance pattern, regimen type, and outcome therapy. Researchers followed all guidelines as per the Declaration of Helsinki and good clinical practice. Patients whose data were complete were included as samples; previously, TB-IS officers were asked to fill out the patient consent.

Data Analysis

The data were analyzed descriptively to determine the prevalence of drug-resistant tuberculosis cases. Researchers followed all guidelines as per the Declaration of Helsinki and acceptable clinical practice. Patients with drug-resistant tuberculosis.

Treatment outcome data between the patient groups given conventional therapy and BPAL/M therapy were compared using the Mann-Whitney test. Statistical analysis was performed using SPSS software version 30. The analysis showed a $P < 0.05$ value, indicating a difference in treatment outcomes between the two treatment groups. A bivariate analysis was then conducted to examine the relationship between the characteristics of patients receiving BPAL/M therapy and treatment outcomes.

The chi-square test was used using SPSS version 30 software. The analysis showed a $P < 0.05$ value, indicating a correlation between patients' characteristics and treatment outcomes for those receiving the BPAL/M regimen. The linear regression test was used to identify the most predictive factors of treatment success.

Results and Discussion

Incidence and Characteristics of Multidrug-Resistant Tuberculosis (MDR-TB)

Based on these data, the incidence of DR-TB in South Kalimantan has increased from 2022 to 2024, as shown in Figure 1. Characteristics of DR-TB patients can be seen in Table 1. Drug-resistant tuberculosis in South Kalimantan occurs most in the elderly age group (> 45 years) (56.3%) and in males (59.6%) and primarily affects nonworking groups (58%), such as homemakers, retirees, students, and prisoners. As a person ages, their immune system declines. Most TB cases among the elderly result from the reactivation of latent TB due to immunosenescence. Age is a predisposing factor for behavioural changes related to the physical and psychological maturity of TB patients. In older adults, treatment non-compliance is higher due to forgetfulness and resignation to the disease. A Previous research has shown that age significantly influences medication adherence in TB patients, with the majority of non-compliant patients being over 35 years old⁷. This non-compliance with treatment can be a contributing factor to TB drug resistance.

Historically, the most drug-resistant TB patients were found in individuals with prior treatment (60%). This group includes those who relapsed, failed treatment, or dropped out. Relapsing, failing treatment, or dropping out of treatment significantly increases this risk. Patients who received oral antituberculosis treatment (OAT) briefly or improperly are also at high risk of developing resistance. The manifestation of DR-TB in these patients can be attributable to a history of prior close contact with individuals afflicted by tuberculosis (TB) or to the patient's lack of transparency in disclosing information about previous treatment.⁽⁸⁾.

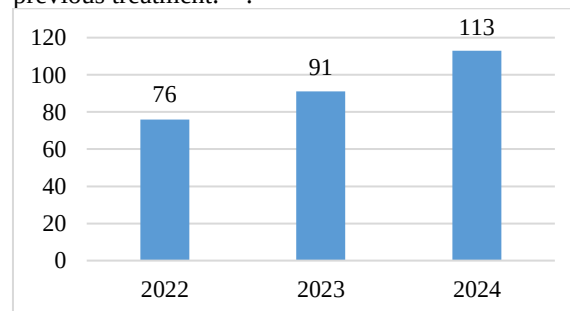


Figure 1. Incidence of DR- TB in South Kalimantan in 2022-2024

Table 1. Characteristics of DR-TB patients

Characteristics	Category	MDR-TB (245) N (%)
Age	<45 (dewasa)	107 (43.7)
	>45 (lansia)	138 (56.3)
Sex	Male	146(59.6)
	Female	99 (40.4)
Occupation	Employed	103 (42)
	Unemployed	142 (58)
Pregnant status	Yes	2 (0.8)
	No	243 (99.2)
History of previous TB	New	98 (40)
	Relapse	147 (60)
Comorbidity with Diabetes Mellitus	Yes	60 (24.5)
	No	185 (75.5)
Regimen Therapy	Short-term Regimen	133 (54.3%)
	Long-term/Individual regimen	58 (23.7%)
	BPaL/M Regimen	54 (22 %)

Multi-drug Resistance Tuberculosis Patterns

Most patients were rifampicin-resistant TB patients (242), including 98 new patients and 147 patients who had previously received therapy, as seen in Table 2. A previous study by Azwar et al. (2017) in Banjarmasin explained that pulmonary tuberculosis sufferers with MDR-TB at Ulin Banjarmasin Regional Hospital in the period

December 2015-2016 had dominant results detected with rifampicin-sensitive TB patients (35 patients), and only 19 patients were rifampicin-resistant*. Between 2015 and 2024, Banjarmasin City experienced a rise in the incidence of rifampicin-resistant tuberculosis patients, especially in patients who had previously received therapy, as seen in Figure 3.

Table 2. Resistance pattern of DR-TB patient in South Kalimantan in 2022-2024

Resistance pattern	New	Previous	Total
Any resistance to R	98	144	242
Any resistance to H	24	50	74
TB resistance to rifampicin	98	144	242
Resistance to R only	51	80	131
Resistance to H only	0	0	0
Total mono resistance	51	80	131
H+Z	0	0	3
R+Z	0	0	40
Total polyresistance	0	0	43
H+R	14	20	34
H+R+Z	10	23	33
Total MDR TB	24	43	67
Pre XDR TB	0	4	4
XDR TB	0	0	0

*R = Rifampicin; H = Isoniazid; Z = Pyrazinamide; Pre-XDR TB = Pre- Extensively Drug Resistant Tuberculosis; XDR TB = Extensively Drug Resistant Tuberculosis

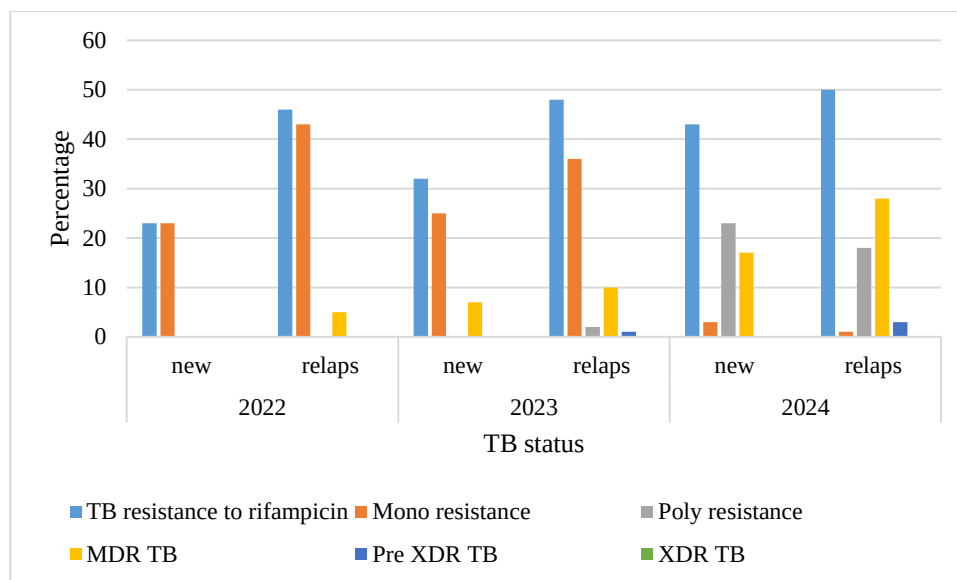


Figure 3. Resistance pattern of DR-TB patient in South Kalimantan in 2022-2024

Table 2 shows that 67 patients were included in the multidrug-resistant tuberculosis category, namely resistance to rifampicin and isoniazid. Four patients were categorized as pre-extensively drug-resistant, specifically a tuberculosis patient demonstrating resistance to rifampicin and isoniazid, as well as demonstrating resistance to fluoroquinolone antibiotics. MDR-TB patients and pre-XDR TB patients have increased from 2022 to 2024, as shown in Figure 3. In 2022, MDR-TB patients just found were patients who had previously received TB therapy but failed or relapsed. But, in 2023-2024, MDR-TB was not only found in patients who had previously received TB therapy but also in new patients.

The main drug resistance genes in *Mycobacterium tuberculosis* include *katG* and *inhA* (isoniazid); *rpoB* (rifampicin); *embB* (ethambutol); *pncA* (pyrazinamide); *gyrA/gyrB* (fluoroquinolones); *rrs/rpsL* (streptomycin); and *tylA* (kanamycin, amikacin, capreomycin) [8,9,10]. Kusumaningrum (2024) reported that mutations at codons 529-533 (probe E) of *rpoB* were found in 56.8% of rifampicin-resistant TB samples at Soetomo General Hospital, Indonesia [9].

Various factors contribute to TB drug resistance, including biological and socioeconomic variables, such as high mutation rates, inadequate therapy, noncompliance, and weak health systems with limited diagnostics [10-12]. Patient's compliance with TB medication can be impacted by counselling and counselling combined with leaflets [12,13]. To stop the spread of drug-resistant TB, these problems must be addressed through better surveillance, treatment quality control, patient education, and health system strengthening [14]. Bivariate chi-square analysis showed no correlation between age, sex, occupation, TB history, or diabetes comorbidity and resistance patterns among MDR-TB patients in South

Kalimantan in 2022-2024. Even though, the categories of mono-resistance, multidrug resistance, and pre-extensively drug resistance were mostly in patients who have previously received medication with prior treatment failure or relapse.

Findings suggest that a history of incorrect treatment was a major contributing factor to the emergence of Multidrug-Resistant Tuberculosis (MDR-TB) in patients who have previously received medication [15]. Incorrectly consuming anti-tuberculosis drugs, for example, consuming them with food. Food-drug interactions are known to diminish the bioavailability of first line anti-tubercular agents, particularly rifampicin (RIF) and isoniazid (INH) resulting in decrease plasma concentrations [16]. A Previous research conducted in India confirmed that food intake significantly diminished the concentration of these drugs and impeded their absorption [17]. Sub-therapeutic plasma concentrations of anti-tuberculosis drugs subsequently elevate the risk of both therapeutic failure and the emergence of drug resistance. Consequently, patients with tuberculosis should be counselled to administer these medications before meals or on an empty stomach to mitigate the risk of therapeutic failure.

Effectiveness BPAL/M Regimen of Multi drug resistance Tuberculosis

In 2022-2024, 54.7% of drug-resistant tuberculosis patients in South Kalimantan received a short-term regimen, and 23.67% patients received a long-term/individual regimen, as seen in Table 1. The short-term regimen includes 7 drugs during the initial phase (Bedaquiline, Levofloxacin, Clofazimine, Ethionamide, INH, Pyrazinamide, and Ethambutol) and 4 drugs in the advanced phase (Levofloxacin, Clofazimine, Ethionamide, and Pyrazinamide) over a duration of 9-11 months. The standardized shorter regimen shows reduced

treatment failure and good outcomes. Baseline drug susceptibility testing and minimizing missed doses are essential for implementation⁽¹⁸⁾. Patients ineligible for short-term therapy receive long-term treatment lasting 18-24 months. Adverse drug reactions (ADRs) tend to increase with treatment duration, though no correlation exists between regimen type and ADR severity⁽¹⁵⁾. Unlike short-term therapy, long-term DR-TB treatment can be individualized based on patient condition, resistance profile, and clinical status, enhancing regimen efficacy and safety⁽¹⁹⁾.

In May 2022, the World Health Organization issued a rapid communication indicating that the six-month all-oral BPaLM regimen could be programmatically implemented for patients aged ≥ 15 years with rifampicin-resistant tuberculosis (RR-TB) who have not previously been exposed to bedaquiline, pretomanid, and linezolid⁽²⁰⁾. However, long treatment durations and adverse effects may reduce patient compliance, highlighting the urgent need for shorter regimens with fewer drugs⁽²¹⁾. In Indonesia, BPaL/BPaLM has been included as an optional therapy since 2023 for RR-TB or MDR-TB patients who have not received bedaquiline, pretomanid, linezolid or delamanid within 1 month⁽²²⁾. This study showed 54 patients (57.5%) in South Kalimantan got BPaL/BPaLM therapy starting in 2024. Fifty-four patients who get BPaL/BPaLM met inclusion criteria like (1) RR-TB or MDR-TB cases; (2) adults or adolescents over 14 years of age, irrespective of HIV status; (3) pulmonary or extrapulmonary TB (excluding CNS, osteoarticular, and miliary TB); (4) patients who have not received bedaquiline, pretomanid, linezolid, or delamanid for more than one month are eligible, unless drug susceptibility testing (DST) supports continued use; (5) not pregnant or breastfeeding women since the safety of pretomanid is lacking in such settings; (6) drug susceptibility for fluoroquinolones was utilized to assess the eligibility for moxifloxacin. Regimens can be continued without moxifloxacin (BPaL) if drug susceptibility testing findings show resistance to fluoroquinolones (pre-XDR-TB); (7) patients with resistance to bedaquiline, linezolid, or pretomanid are considered defaulters and receive individualized regimens; (8) pregnant/nursing women and patients not meeting criteria for BPaL/BPaLM receive individualized or shorter nine-month regimens tailored to clinical status and resistance profiles.

BPaL/M regimen therapy may increase a patient's compliance because it has a short therapy duration (6 months) compared to short/long regimen therapy with a long therapy duration of up to 18 months. BPaLM consists of a combination bedaquiline, pretomanid, linezolid and moxifloxacin. This medication combination addresses the various bacterial stages during infection by targeting both

proliferating and non-proliferating tubercle bacilli. This method guarantees a thorough treatment plan that successfully addresses the whole range of tubercle bacilli populations⁽²³⁾.

Bedaquiline, a new antituberculosis drug, has been implemented globally for the treatment of DR-TB. As previously mentioned, it provides better outcomes and is generally well tolerated with few side effects⁽²⁴⁾. Linezolid, an antibiotic of the oxazolidinone class, works by inhibiting the early stages of bacterial protein synthesis. It binds to the 50S ribosomal subunit at a specific site, the 23S rRNA, and prevents the formation of a functional 70S initiation complex. Although classically considered bacteriostatic, linezolid exhibits significant activity against *Mycobacterium tuberculosis* and can be bactericidal, particularly at concentrations achieved in lung lesions. Its potent activity against actively replicating strains of *Mycobacterium tuberculosis* makes it a key component for achieving rapid sputum conversion.

Pretomanid, a compound from the nitroimidazooxazine class, is a product activated by the enzyme deazaflavin-dependent nitroreductase (Ddn) in *Mycobacterium tuberculosis* cells. This drug has a unique and dual mechanism of action because it is clinically active against replicating and non-replicating bacilli through two main mechanisms. Pretomanid is bactericidal by disrupting mycolic acid synthesis in the cell wall and inhibiting *Mycobacterium tuberculosis* protein synthesis. Pretomanid is also able to kill persister/dormant bacteria by releasing nitric oxide (NO), which is toxic and lethal to *Mycobacterium tuberculosis*. NO can inhibit cytochrome c-oxidase, causing a significant decrease in ATP concentration in bacterial cells. This activity under anaerobic conditions explains the efficacy of pretomanid against non-replicating mycobacteria, which is comparable to the efficacy of rifampin and linezolid in inhibiting the growth of the dormant phenotype of *Mycobacterium tuberculosis*, thereby shortening the duration of therapy and preventing relaps⁽²⁵⁾.

The BPaL regimen combines three drugs with distinct mechanisms of action. Bedaquiline targets ATP synthesis, linezolid inhibits protein synthesis, and pretomanid disrupts cell walls and kills persister/dormant bacteria. This combination creates a highly effective, multifaceted attack. Pretomanid, along with bedaquiline, forms the foundation for initial bactericidal activity and, more importantly, sterilizing activity. Its ability to kill different bacterial populations (replicating and non-replicating) complements the actions of bedaquiline and linezolid, allowing for more rapid and comprehensive bacterial eradication⁽²⁶⁾.

The BPaLM regimen, recommended for treating patients with DR-TB without fluoroquinolone resistance, has the advantage of a

shorter therapy duration of six months than previously recommended. This recommendation is based on previous TB clinical trials, Zenix TB, and TB-PRACTECAL. The introduction of BPAL and BPALM provides a bright future for the treatment of DR-TB patients with a success rate of >85% and shows tolerable side effects⁽²¹⁾.

This study compares the features of drug-resistant TB patients undergoing short/ long / Individual-term versus BPAL/ M therapy in Table 3. The chi-square indicates correlation between sex

(P=0.037), history of previous TB (P=0.031) and resistance pattern (P=0.000) with the therapeutic regimen for DR-TB patients in South Kalimantan in 2022-2024. Patients who received short/long/individual regimen therapy and BPAL/M were mostly rifampicin resistance-TB patients, as seen in Table 3. While patients who received short/long/individual regimen therapy were mostly relapse patients, patients who received BPALm/BPAL regimen therapy were mostly new as seen in Table 3.

Table 3. Comparison of characteristics of short/long/individual regimen (conventional regimen) therapy patients and BPALM regimen therapy patients

Characteristics	Category	Conventional Regimen (191)	BPALM (54)	p-value
		N (%)	N (%)	
Age	<45 (dewasa)	81 (42.4)	26 (48.2)	0.372
	>45 (lansia)	110 (57.6)	28 (51.8)	
Sex	Male	120 (62.8)	26 (48.2)	0.037
	Female	71 (37.2)	28 (51.8)	
Occupation	Employed	82 (42.9)	21 (38.9)	0.473
	Unemployed	109 (57.1)	33 (61.1)	
Pregnant status	Yes	2 (1)	0 (0)	0.456
	No	189 (99)	54 (100)	
History of previous TB	New	70 (36.7)	28 (51.8)	0.031
	Relaps	121 (63.3)	26 (48.2)	
Comorbid of Diabetes Mellitus	Yes	47 (24.6)	13 (24.1)	0.724
	No	144 (75.4)	41 (75.9)	
Resistance pattern	Rifampicin-Resistance TB	190 (99.5%)	54 (100)	0.000
	Monoresistance	128 (67)	2 (3.7)	
	Polyresistance	20 (10.5)	23 (42.6)	
	MDR-TB	40 (20.9)	28 (51.8)	
	Pre-XDR TB	3 (1.6)	1 (1.9)	
	XDR TB	0 (0)	0 (0)	
Therapy Outcome	Cured	60 (31.4)	47 (87)	0.000
	Completed treatment	13 (6.8)	0 (0)	
	Failure	14 (7.3)	0 (0)	
	Dropped out	33 (17.3)	2 (3.7)	
	Died	32 (16.8)	5 (9.3)	
	Not evaluated/Still on treatment	39 (20.4)	0 (0)	

Patients who got the BPAL/M regimen were mostly cured (87%), the same as patients who got the conventional regimen (31.4%), as seen in Table 3. Shows a higher percentage of cure rate in patients with the BPAL/M therapy regimen compared to patients who got the conventional regimen. None of the patients who received the BPAL/M regimen experienced therapy failure (0%), whereas in patients who were given conventional therapy, 7.3% failed to complete treatment. Likewise, for the results of patients who dropped out and died from drugs, in patients who received BPAL/M therapy, the number was smaller compared to patients who received conventional therapy regimens. The Mann-Whitney test showed a significant difference in clinical outcome results between patients given

conventional therapy and BPAL/M therapy (P=0.000). The Mann-Whitney test also compared the rankings between therapy groups. The group of patients given conventional therapy had a higher ranking (mean rank 137.99) compared to the group of patients given the BPAL/M regimen (mean rank 69.99). It can be concluded that the group of patients given conventional therapy showed a higher possibility of treatment failure when compared to the group of patients given the BPAL/M regimen. This may be due to the BPAL/M regimen therapy, which maybe can increase a patient's compliance because it has a short therapy duration (6 months) compared to short/long regimen therapy with a long therapy duration of up to 18 months.

The results of the bivariate analysis using chi-square aimed to determine the factors that influence the treatment success of DR TB patients given BPAL/M, as in Table 4. The chi-square indicates a correlation between sex (0.040) and the treatment success for DR-TB patients given BPAL/M. Female patients (57.4%) who received BPAL/M had a higher treatment success than male patients (42.6%). Female patients had a 0.123 times greater chance of having higher treatment success in

DR TB patients given BPAL/M (RR 95% CI = 0.123 (0.014–1.108)). Female patients may have a higher level of understanding and compliance with treatment.⁽²⁶⁾ Table 5 presents predictive factors for treatment success in BPAL/M regimens. The multivariate statistical test with logistic regression in Table 5 shows that sex (OR=10.772; %CI: 1.051–110.416, P=0.045) has a significant correlation with TB treatment success, while comorbidities of diabetes mellitus and resistant patterns are not.

Table 4. Bivariate analysis using chi square aimed to determine the factors that influence the treatment success of DR TB patients given BPAL/M

Characteristics	Category	Cured/Completed treatment (47)	Failure/Dropped out/Died (7)	p-value	ODS Ratio	95% CI
		N (%)	N (%)			
Age	<45 (dewasa)	24 (51.1)	2 (28.6)	0.480	2.609	0.459-14.814
	>45 (lansia)	23 (48.9)	5 (71.4)			
Sex	Male	20 (42.6)	6 (85.7)	0.040	0.123	0.014-1.108
	Female	27 (57.4)	1 (14.3)			
Occupation	Employed	16 (34)	5 (71.4)	0.071	0.206	0.036-1.185
	Unemployed	31 (66)	2 (28.6)			
Pregnant status	Yes	0 (0)	0 (0)	-	-	-
	No	47 (100)	2 (100)			
History of previous TB	New	25 (53.2)	3 (42.9)	0.457	1.515	0.305-7.526
	Relaps	22 (46.8)	4 (57.1)			
Comorbid of Diabetes Mellitus	Yes	10 (21.3)	3 (42.9)	0.213	0.360	0.069-1.880
	No	37 (78.7)	4 (57.1)			
Resistance pattern	Rifampicin-Resistance TB	47 (100)	7 (100)	0.059	-	-
	Monoresistance	2 (4.3)	0 (0)			
	Polyresistance	21 (44.7)	2 (28.6)			
	MDR-TB	24 (51.1)	4 (57.1)			
	Pre-XDR TB	0 (0)	1 (14.3)			
	XDR TB	0 (0)	0 (0)			

Table 5. Predictive factors of treatment success in BPAL/M regimens with multivariate analysis

Characteristics		p-value	ODS Ratio	95% CI	
Sex	Male	0.045	10.772	1.051	110.416
	Female				
Comorbid of Diabetes Mellitus	Yes	0.109	5.172	0.0692	38.685
	No				
Resistant Pattern	Non MDR TB	0.184	0.250	0.032	1.938
	MDR-TB				

Conclusion

This study indicates a correlation between sex (0.037), history of previous TB ($P=0.031$), and resistance pattern ($P=0.000$) with the therapeutic regimen for DR-TB patients in South Kalimantan in 2022-2024. Patients who received short/long/individual regimen therapy and BPAL/M were mostly rifampicin-resistant TB patients, while patients who received short/long/individual regimen therapy were mostly relapse patients, and patients who received BPALm/BPAL regimen therapy were mostly new. Patients who got the BPAL/M regimen were mostly cured (87%), the same as patients who got the conventional regimen (31.4%). None of the patients who received the BPAL/M regimen experienced therapy failure (0%), whereas in patients who were given conventional therapy, 7.33% failed to complete treatment. Likewise, for the results of patients who dropped out and died from drugs, in patients who received BPAL/M therapy, the number was smaller compared to patients who received conventional therapy regimens. The Mann-Whitney test showed a significant difference in clinical outcome results between patients given conventional therapy and BPAL/M therapy (0.000), and the Whitney Man test also compared the rankings between therapy groups. The group of patients given conventional therapy had a higher ranking (mean rank 137.99) compared to the group of patients given the BPAL/M regimen (mean rank 69.99). It can be concluded that the group of patients given conventional therapy showed a higher possibility of treatment failure when compared to the group of patients given the BPAL/M regimen. Predictive factors of treatment success in BPAL/M regimens with logistic regression show that sex ($OR=10.772$; $\%CI: 1.051-110.416$, $P=0.045$) has a significant correlation with TB treatment success, while comorbidities of diabetes mellitus and resistant patterns do not. There needs to be an effort to achieve successful therapy in male patients by increasing understanding and compliance with therapy through various efforts, for example, reminders to take medication.

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Conflicts of Interest

Absence of any conflicting interests.

Funding

Absence of any funding.

Ethics Statements

We have received the ethical approval from the related institution(s) by Komisi Etik Penelitian

Kesehatan Universitas Muhammadiyah Banjarmasin (Health Research Ethics Commission of Muhammadiyah University of Banjarmasin) No. 546 / UMB / KE/XII/2024.

Author Contribution

The authors confirm contribution to the paper as follows: study conception and design: DADS; data collection: IMN; analysis and interpretation of results: DADS; draft manuscript preparation: DADS, NI. All authors reviewed the results and approved the final version of the manuscript.

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