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Trends Of Multidrug-Resistant Tuberculosis (MDR-TB) in Southeast Sulawesi: A Literature Review

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Abstract

Multidrug-resistant tuberculosis (MDR-TB) poses a major challenge to the tuberculosis (TB) elimination program in Indonesia. MDR-TB imposes a greater burden because it requires longer and more expensive treatment and carries a higher risk of treatment failure compared to drug-susceptible TB. Southeast Sulawesi, as one of the provinces in eastern Indonesia, is experiencing an increase in MDR-TB cases; however, epidemiological data and local analyses remain limited. This review aims to analyze the trends of MDR-TB in Southeast Sulawesi based on recent literature, identify its risk factors, and highlight the challenges and intervention strategies for MDR-TB control. This study employed a narrative literature review approach by searching articles from PubMed, Scopus, Google Scholar, GARUDA, as well as reports from the Indonesian Ministry of Health and Provincial Health Office, covering the period of 2015–2025. Articles discussing the epidemiology, diagnosis, risk factors, treatment, or policies on MDR-TB relevant to national or local contexts were included. The review indicates an increasing trend of MDR-TB in Indonesia, including Southeast Sulawesi, with major risk factors such as incomplete TB treatment history, poor treatment adherence, delayed diagnosis, and patients' socio-economic conditions. Limited access to rapid diagnostics (GeneXpert) and second-line drugs also remains a significant barrier. Studies from neighboring regions emphasize that family support, patient education, and community-based interventions can improve treatment success. MDR-TB control efforts in Southeast Sulawesi require a multidimensional approach through expanded access to rapid diagnostics, strengthening healthcare worker capacity, optimizing referral systems, and implementing social interventions to improve adherence. Further local research is needed to accurately map MDR-TB epidemiology as the basis for regional policy.

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Introduction

Tuberculosis (TB) remains a major public health problem globally and in Indonesia. According to WHO reports, despite improvements in TB detection and control efforts, TB continues to be one of the leading causes of death from infectious diseases worldwide, and drug-resistant forms of TB, including MDR-TB, pose a threat to TB elimination programs. The WHO has issued consolidated guidelines for the treatment of drug-resistant TB, emphasizing the need for rapid diagnostics, new all-oral regimens, and an integrated programmatic approach (WHO, 2022; WHO, 2023).

In Indonesia, the burden of DR-TB/MDR-TB is relatively high compared to many countries, with major challenges in the diagnostic-to-treatment cascade and treatment success. National reviews and PMDT (Programmatic Management of Drug-resistant TB) implementation studies have found that although access to molecular technologies (e.g., Xpert MTB/RIF) has increased, only a small proportion of

DR-TB cases successfully complete the full continuum of care (diagnosis, referral, treatment); this indicates gaps in diagnostic coverage, case tracking, and patient support (Lestari, 2023).

The concept of rapid diagnostics (Xpert MTB/RIF and its advanced variants) has revolutionized TB and rifampicin resistance detection within hours, but diagnostic studies highlight operational limitations, including false negatives, interpretation challenges in populations with non-tuberculous mycobacteria (NTM), and limited coverage in remote areas, which can delay or prevent MDR-TB detection. Therefore, expanding diagnostic coverage and evaluating diagnostic algorithms remain programmatic priorities (Kusumaningrum et al., 2024).

At the provincial level, local evidence shows an upward trend in MDR-TB cases in some eastern regions of Indonesia. Retrospective studies in Southeast Sulawesi (2014–2017) reported an increasing number of MDR-TB cases, while reports and studies from referral hospitals in Sulawesi (e.g., Palu, Makassar) confirm similar resistance patterns and clinical management challenges (Aini & Rufia, 2019; Koraag et al., 2024).

Commonly identified determinants in Indonesian and regional studies include: (1) a history of previous TB treatment or treatment failure; (2) poor treatment adherence due to side effects, cost, and access barriers; (3) socio-economic determinants (poverty, low education); and (4) health system constraints such as limited human resources for PMDT, second-line drug distribution, and suboptimal referral mechanisms (Sanaun Harahap et al., 2024).

The development of new therapies (e.g., bedaquiline and BPaL/BPaLM regimens) and the adoption of shorter all-oral regimens have shown increased cure rates in several referral centers. However, the implementation of these therapies requires logistical support, monitoring for adverse effects, and equitable drug access—challenges that persist in many areas of Indonesia. Domestic studies (e.g., seven-year bedaquiline studies in referral hospitals) and international reviews indicate encouraging results regarding reduced lost-to-follow-up rates and improved outcomes when bedaquiline is well-implemented (Setyawan et al., 2023; Gualano et al., 2024).

Furthermore, molecular and genotyping studies in Sulawesi and surrounding areas emphasize the need for genetic surveillance to understand strain distribution patterns, detect clonal transmission, and monitor the emergence of new drug resistance. Such molecular data are critical for designing more targeted TB control interventions (Koraag et al., 2024).

In summary, despite technological advancements and the adoption of WHO guidelines, MDR-TB control in Indonesia, including Southeast Sulawesi, is hindered by gaps in detection, treatment delays, limited patient support, and disparities in access to services and drugs. Therefore, a literature review compiling local and national evidence is essential to inform programmatic strategies and context-specific policies for provinces like Southeast Sulawesi.

Methods

This study is a narrative literature review focusing on journals and research reports containing empirical data on drug-resistant tuberculosis (MDR-TB), particularly in Indonesia and Southeast Sulawesi. Literature searches were conducted in the PubMed, Scopus, Google Scholar, GARUDA, and Neliti databases, as well as in official reports from the WHO and the Indonesian Ministry of Health.

A total of 50 publications meeting the inclusion criteria (published between 2015 and 2025, specifically addressing MDR-TB, and highlighting epidemiology, risk factors, diagnosis, or control strategies) were analyzed. Studies that were irrelevant or focused on drug-sensitive TB without resistance were excluded.

Data extracted from each publication included the study location, study design, methods used, variables examined, and the main research findings. All data were then synthesized thematically to identify patterns and trends in MDR-TB incidence, programmatic challenges, and policy intervention recommendations.

Results

Based on the results of the literature review, it was found that the occurrence of drug-resistant tuberculosis (MDR-TB) in Southeast Sulawesi is influenced by a range of complex factors. These factors include a history of previous TB treatment, poor treatment adherence, socio-economic determinants such as poverty and low education, as well as limitations in the health service system, including access to diagnostics, distribution of second-line drugs, and suboptimal referral mechanisms. These conditions contribute to delayed diagnosis, lower treatment success, and an increased risk of wider transmission in the community. From the publications analyzed, 10 journals and research reports that were most relevant and met the inclusion criteria were selected for further analysis in this study.

Table 1. Systematic Review

No.	Autor / Year	Title	Methods	Results
1	Aini & Rufia (2019)	Characteristics of MDR-TB Patients in Southeast Sulawesi 2014–2017	Retrospective descriptive	The study found that MDR-TB cases increased from 7 (2014) to 28 (2017), with rifampicin resistance being dominant
2	Chasanah et al. (2023)	Risk Factor Identification of MDR-TB	Factor analysis	Analysis showed that previous TB treatment, poor adherence, and malnutrition were dominant factors for MDR-TB.
3	Kusumaningrum et al. (2024)	Availability and Utilization of GeneXpert Facilities for DR-TB Testing in Indonesia	Policy analysis	The study showed that GeneXpert availability has increased, but MDR-TB testing coverage remains low in eastern Indonesia.
4	Maulina et al. (2024)	GeneXpert Performance for RR-TB Detection	Cross-sectional	The study showed that GeneXpert effectively detects RR-TB, but limited access in remote areas causes diagnostic delays.
5	Kondolele et al. (2024)	Drug Resistance of TB Patients at Makassar Lung Health Center	Qualitative case study	The study showed that family support improved adherence, while stigma and access barriers increased MDR-TB therapy dropout.
6	Koraag et al. (2024)	Strain Identification of MDR-TB Patients in Palu	Molecular laboratory	The study showed that MTBC genotype variations indicate local MDR-TB transmission.
7	Setyawan et al. (2023)	Profile of MDR-TB Regimen and Treatment Outcomes	7-year retrospective	The study showed that bedaquiline increased treatment success rates, with a reduction in lost-to-follow-up
8	Farid Thariqulhaq & Wahyono (2023)	Systematic Review on Bedaquiline Safety & Effectiveness	Systematic review	The study showed that bedaquiline regimens are safe and effective, with cure rates >70% in MDR-TB.
9	Sanaun Harahap et al. (2024)	Medication Adherence among DR-TB Patients	Policy review	The study showed that adherence levels remain low (<60%), and social support positively affects adherence.
10	Lestari (2023)	Management of DR-TB in Indonesia: Challenges & Opportunities	Policy review	The study highlighted major challenges: second-line drug distribution, limited human resources, and suboptimal referral systems

Discussion

The results of the literature review indicate that the burden of MDR-TB in Indonesia remains high and has tended to increase in recent years. In Southeast Sulawesi, retrospective studies reported an increase in the number of MDR-TB cases during 2014–2017, with rifampicin resistance as the dominant pattern (Aini & Rufia, 2019). This increase aligns with WHO reports (2023), which emphasize that Indonesia is one of the three countries contributing the most to the global MDR-TB burden, driven by suboptimal TB treatment success and delays in case detection.

Risk factors contributing to the emergence of MDR-TB across various studies include incomplete previous TB treatment, poor patient adherence to therapy regimens, and social and economic barriers limiting access to health services. Studies in Indonesia confirm that patients with a history of treatment failure are at higher risk of developing MDR-TB (Chasanah et al., 2023; Fahlafi et al., 2023). Furthermore, research on patient adherence shows that family and social support play a crucial role in improving adherence, while the absence of support increases the risk of treatment interruption (Harahap et al., 2024). This situation is exacerbated by social stigma surrounding TB, which causes some patients to delay testing and treatment (Kondolele et al., 2024).

From a diagnostic perspective, although Indonesia has expanded the use of GeneXpert as the primary tool for rifampicin resistance detection, coverage remains uneven. In eastern Indonesia, including Southeast Sulawesi, limited diagnostic facilities are a major barrier to identifying MDR-TB cases (Kusumaningrum et al., 2024; Maulina et al., 2024). This results in delayed diagnoses and continued transmission in the community.

Regarding therapy, the development of new bedaquiline-based regimens and short-course all-oral regimens has shown promising outcomes. A retrospective study at Dr. Soetomo Hospital in Surabaya reported that bedaquiline use was associated with increased treatment success rates and reduced treatment interruption (Setyawan et al., 2023). Systematic reviews also support the safety and effectiveness of bedaquiline, with cure rates exceeding 70% (Thariqulhaq & Wahyono, 2023). Nevertheless, the implementation of these regimens is still constrained by limited second-line drug distribution, the need for strict monitoring of side effects, and relatively high costs (Lestari, 2023).

Other findings highlight the importance of molecular surveillance to understand local MDR-TB strain distribution. Genotyping studies in Palu, Central Sulawesi, revealed genetic variations in Mycobacterium tuberculosis indicating local MDR-TB transmission (Koraag et al., 2024). These data are relevant for Southeast Sulawesi as they can inform geographically targeted control interventions.

Overall, the literature underscores that MDR-TB control in Southeast Sulawesi requires not only clinical approaches but also comprehensive strategies that include expanding rapid diagnostics, strengthening healthcare workforce capacity, ensuring availability of second-line drugs, and implementing social interventions to improve adherence. Family support and patient education are critical components that must be prioritized, while strengthening referral systems and technology-based monitoring can accelerate the link between diagnosis and therapy. Therefore, this review emphasizes the need for a multidimensional approach to reduce the MDR-TB burden in Southeast Sulawesi.

Conclusion

This literature review indicates that the burden of MDR-TB in Indonesia, including Southeast Sulawesi, remains high and tends to increase. Dominant risk factors include a history of previous TB treatment, poor therapy adherence, socio-economic barriers, and limited access to rapid diagnostic services and second-line drugs. These findings highlight that MDR-TB is not only a clinical issue but is also influenced by social, psychological, and health system factors.

The use of molecular diagnostics (GeneXpert) has proven effective in accelerating MDR-TB case detection; however, distribution and coverage in eastern Indonesia remain uneven. On the other hand, the implementation of new bedaquiline-based therapy regimens offers hope for improved cure rates, but its application is still limited by drug availability and the need for strict monitoring. Additionally, family support and community-based interventions play a crucial role in enhancing patient adherence, thereby positively impacting treatment success.

Overall, MDR-TB control efforts in Southeast Sulawesi require a multidimensional approach, including: expanding access to rapid diagnostics, strengthening healthcare workforce capacity, equitable distribution of second-line drugs, enhancing patient social support, and strengthening referral systems. Furthermore, more comprehensive local research is needed to map the epidemiological trends and MDR-TB genotype patterns in Southeast Sulawesi, providing a foundation for the formulation of more context-specific policies.

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