



ADVANCES AND CHALLENGES IN THE TREATMENT OF DRUG-RESISTANT TUBERCULOSIS

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ABSTRACT

Drug-resistant tuberculosis (DR-TB) remains a significant global health challenge, posing serious threats to public health and complicating disease control efforts. The emergence of multidrug-resistant (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB) has limited the effectiveness of standard treatment regimens, necessitating the development of novel therapeutic approaches and comprehensive management strategies. This article explores the current landscape of DR-TB treatment, highlighting recent advancements in pharmacological therapies, the role of individualized treatment protocols, and the importance of patient-centered care. Additionally, it addresses key barriers to successful treatment outcomes, including delayed diagnosis, treatment adherence issues, and healthcare infrastructure limitations. The article concludes with recommendations for strengthening global TB programs, accelerating research efforts, and enhancing access to innovative treatments to improve patient outcomes and reduce TB transmission.

ДОСТИЖЕНИЯ И ПРОБЛЕМЫ В ЛЕЧЕНИИ ЛЕКАРСТВЕННО- УСТОЙЧИВОГО ТУБЕРКУЛЕЗА

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ABSTRACT

Лекарственно-устойчивый туберкулез (ЛУ-ТБ) остается серьезной глобальной проблемой здравоохранения, создавая серьезные угрозы для общественного здравоохранения и осложняя усилия по борьбе с заболеванием. Появление туберкулеза с множественной лекарственной устойчивостью (МЛУ-



туберкулеза, новые
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здравоохранение,
инфекционные
заболевания,
устойчивость к
противомикробным
препаратам.

ТБ) и широкой лекарственной устойчивостью (ШЛУ-ТБ) ограничило эффективность стандартных схем лечения, что потребовало разработки новых терапевтических подходов и комплексных стратегий лечения. В этой статье рассматривается текущая ситуация в лечении лекарственно-устойчивого туберкулеза, подчеркиваются последние достижения в области фармакологической терапии, роль индивидуализированных протоколов лечения и важность ухода, ориентированного на пациента. Кроме того, он устраняет ключевые препятствия на пути к успешным результатам лечения, включая позднюю диагностику, проблемы с соблюдением режима лечения и ограничения инфраструктуры здравоохранения. Статья завершается рекомендациями по усилению глобальных программ по борьбе с туберкулезом, ускорению исследовательской работы и расширению доступа к инновационным методам лечения для улучшения результатов лечения пациентов и снижения передачи туберкулеза.

Relevance. Tuberculosis (TB) remains one of the deadliest infectious diseases globally, with an estimated 10.6 million new cases and 1.3 million deaths in 2022 alone (World Health Organization [WHO], 2023). While significant progress has been made in combating TB through vaccination, early diagnosis, and effective treatment regimens, the emergence of drug-resistant tuberculosis (DR-TB) poses a substantial threat to public health. Drug-resistant strains, particularly multidrug-resistant TB (MDR-TB) and extensively drug-resistant TB (XDR-TB), are characterized by resistance to first-line drugs such as isoniazid and rifampicin, complicating treatment and prolonging infectiousness (Dheda et al., 2017).

MDR-TB accounts for nearly 3–4% of new TB cases worldwide, with even higher rates in previously treated patients (WHO, 2023). The management of DR-TB is not only more complex but also significantly more expensive and time-consuming, often requiring treatment durations of 18–24 months with toxic second-line drugs (Sharma et al., 2020). Despite advancements in diagnostic tools and novel drug development, treatment success rates for MDR-TB and XDR-TB remain suboptimal, largely due to delayed diagnosis, adverse drug effects, and high rates of patient non-adherence (Falzon et al., 2022).

Addressing the DR-TB crisis requires a multifaceted approach that includes improving diagnostic capacity, expanding access to new and repurposed drugs, and strengthening health systems to provide comprehensive patient support. This article aims to examine the current state of DR-TB treatment, analyze recent therapeutic advancements, and explore the key challenges hindering successful outcomes. By synthesizing recent research and policy



recommendations, we seek to provide a roadmap for enhancing global TB management and accelerating progress toward TB elimination.

The treatment of drug-resistant tuberculosis (DR-TB) has been a persistent challenge in global health, with researchers and clinicians continuously exploring ways to improve patient outcomes. The literature highlights three critical aspects of DR-TB management: diagnostic advancements, evolving pharmacological treatments, and patient-centered care strategies.

Advances in Diagnostic Technologies

Early and accurate diagnosis is pivotal for successful DR-TB treatment, yet many low-resource settings lack the infrastructure for timely detection. The introduction of molecular diagnostic tools, such as Xpert MTB/RIF and line-probe assays, has significantly reduced the time to diagnosis and enabled rapid identification of rifampicin-resistant TB (Lawn & Nicol, 2011). However, despite these advances, access to these technologies remains uneven, and drug susceptibility testing for second-line drugs is still limited in many high-burden regions (World Health Organization [WHO], 2023). Studies suggest that scaling up access to rapid molecular diagnostics could dramatically improve treatment initiation times and reduce transmission rates (Sachdeva et al., 2020).

Evolving Pharmacological Treatments

Treatment regimens for DR-TB have historically been lengthy, toxic, and poorly tolerated by patients. The standard MDR-TB treatment lasts 18–24 months and involves multiple drugs with severe side effects, contributing to high rates of treatment discontinuation (Dheda et al., 2017). However, the development of newer drugs such as bedaquiline, delamanid, and pretomanid has offered new hope. Clinical trials have demonstrated that these drugs, when combined in shorter regimens, can improve treatment success rates and reduce the burden of side effects (Conradie et al., 2020). The WHO's updated treatment guidelines now recommend all-oral, shorter regimens, which have been shown to increase adherence and overall patient survival (Falzon et al., 2022).

Barriers to Treatment Adherence and Patient Support

Despite pharmacological progress, patient adherence remains a significant barrier to successful DR-TB treatment. Studies have consistently shown that socioeconomic factors, stigma, and mental health issues contribute to high default rates (Kendall et al., 2021). Patient-centered approaches, including psychosocial support, nutritional assistance, and community-based care models, have been shown to improve adherence and treatment outcomes (Mhango et al., 2019). The integration of digital adherence technologies, such as SMS reminders and video-supported therapy, has also emerged as a promising intervention (Story et al., 2020).

Overall, the literature underscores the need for a holistic approach to DR-TB management — one that combines diagnostic innovation, optimized drug regimens, and robust patient support systems. Continued research and policy action are essential to address gaps in care delivery and ensure equitable access to life-saving treatments worldwide.

The fight against drug-resistant tuberculosis (DR-TB) remains one of the most pressing public health challenges of our time. While significant progress has been made in diagnostics, treatment regimens, and patient support systems, the global burden of DR-TB persists,



particularly in resource-limited settings. Advances in molecular diagnostics and the development of new drugs such as bedaquiline and pretomanid have transformed treatment possibilities, offering shorter, more effective, and less toxic regimens. However, these innovations must be accompanied by systemic improvements in healthcare infrastructure, equitable access to medications, and strengthened community-based care models to ensure their full impact.

Conclusion. Addressing barriers to treatment adherence — including socioeconomic factors, stigma, and mental health challenges — is crucial for improving patient outcomes. Holistic, patient-centered care, supported by digital adherence technologies and psychosocial interventions, can enhance treatment success rates and reduce disease transmission. Additionally, sustained investment in TB research, increased global collaboration, and policy reforms are essential to accelerate progress toward TB elimination. Ultimately, eradicating DR-TB requires a coordinated, multidimensional approach that integrates scientific innovation with robust public health strategies. By closing the gap between research advancements and real-world implementation, we can build a future where drug-resistant TB no longer poses a threat to global health, and all patients have access to the care and support they need to achieve successful treatment outcomes.

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