Letter to Editor   **Open Access**

Enhancing MDR-TB and INH-Resistant TB Management in Africa: The Crucial Role of Genomic Approaches

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Dear Editor,

Tuberculosis is a bacterial disease and one of the 10 leading causes of death, with over 1.5 million deaths annually and African nations accounting for 25% of these mortalities. Drug-resistant tuberculosis (DR-TB) presents significant challenges in Africa due to the high costs, toxic nature, and lengthy duration of existing treatments, which often result in low success rates.[1] In 2018, South Africa and Nigeria are among the top ten countries with highest laboratory confirmed cases of RR/MDR-TB, 13,199 and 2,275 cases respectively.[2] While in December 2022, the World Health Organization (WHO) released new treatment guidelines, setting the foundation for a more patient-centered approach to managing DR-TB.[3] This letter discusses the potential of genomic approaches to improve DR-TB management in Africa and presents recommendations for overcoming the challenges associated with implementing these technologies.

In recent years, there has been an increase in the prevalence of multi-drug-resistant (MDR) such as in isoniazid (INH), and extended-drug-resistant (XDR) TB cases worldwide.[1,3] While 86% of drug-susceptible TB cases are successfully treated globally, the success rate for MDR-TB is only 60%.[1,4] Current diagnostic tools, including culture-based and rapid molecular methods, have limitations that can lead to misdiagnosis, inappropriate treatment, and the amplification of drug resistance.[3,4] Consequently, there is a pressing need for more accurate and efficient diagnostic techniques to guide treatment decisions and control the spread of DR-TB in Africa[1].

Whole-genome sequencing (WGS) offers a powerful method for detecting drug resistance, genetic diversity, and transmission dynamics of *Mycobacterium tuberculosis*.[5] By identifying single nucleotide polymorphisms (SNPs) associated with resistance, WGS can help guide more effective treatment strategies tailored to individual patients' needs. Several TB-specific genome browsers and WGS analysis tools have been developed, such as TBProfiler, which can be employed for genotyping and drug resistance identification.[6]

In Africa, the implementation of genomic approaches to combat drug-resistant tuberculosis (DR-TB) is impeded by several obstacles. Limited resources and infrastructure, coupled with a scarcity of bioinformatics expertise, hinder the widespread adoption of whole-genome sequencing (WGS) in clinical settings.[7] Furthermore, inadequate training, restricted access to genomic data, and reliance on conventional diagnostic methods constrain the comprehensive understanding of DR-TB's regional and local epidemiology. The integration of genomic data into existing surveillance programs presents additional challenges, as do the ethical and data privacy concerns associated with using genomic information in healthcare.[6] Finally, ensuring the long-term financial sustainability of genomic approaches in DR-TB management remains uncertain.

To address these challenges and leverage genomic approaches for DR-TB management in Africa, targeted

strategies are required. Prioritizing resource allocation and infrastructure development, along with investing in capacity building and education, will establish a foundation for the adoption of genomics in clinical laboratories. Promoting data sharing and collaboration will foster a deeper understanding of DR-TB epidemiology, while the integration of genomic tools into diagnostic and surveillance frameworks will streamline data compatibility. Addressing ethical and data privacy concerns through the development of guidelines and regulations will ensure the responsible use of genomic data.[7] Lastly, exploring innovative funding models will help secure sustainable financial support for implementing genomic approaches in DR-TB management.

In conclusion, addressing the challenges of adopting genomic approaches in Africa is crucial for effectively managing drug-resistant tuberculosis. By prioritizing resource allocation, capacity building, data sharing, integration of genomic tools, ethical considerations, and sustainable funding, African countries can harness the power of genomics to improve DR-TB management. These efforts will contribute to better public health outcomes, strengthen the continent's healthcare systems, and foster a more resilient future in the face of emerging health threats.

Authors' Contributions
All authors contributed in all parts of the study and approved the final version of this article

Conflict of Interest Disclosures
The authors declare that they have no conflicts of interest.

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