

# Multidrug-Resistant Tuberculosis affecting Pediatric Populations

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## DESCRIPTION

Multidrug-Resistant Tuberculosis (MDR-TB) poses a particularly serious threat. MDR-TB is defined as resistance to at least isoniazid and rifampin, the two most effective first-line anti-TB drugs. In pediatric populations, disseminated tuberculosis, which affects multiple organ systems, is a severe manifestation of the disease and can present atypically, complicating diagnosis and treatment. Disseminated tuberculosis occurs when *Mycobacterium tuberculosis* spreads from the primary site of infection to other parts of the body, typically through the bloodstream. In children, this condition often arises due to their immature immune systems, making them more susceptible to widespread infection compared to adults. Common sites affected include the lungs, liver, spleen, lymph nodes, and bones. The clinical presentation of disseminated TB in children can vary widely, ranging from fever, weight loss, and fatigue to more specific symptoms like lymphadenopathy, hepatosplenomegaly, or bone pain. The diversity of symptoms often leads to delayed diagnosis, underscoring the need for heightened clinical awareness and prompt investigation.

## Multidrug resistance and presentations of disseminated TB

The emergence of multidrug-resistant tuberculosis complicates the management of pediatric TB. MDR-TB arises primarily due to incomplete or inappropriate treatment of TB, which selects for resistant bacterial strains. In children, transmission is usually from an adult source case with MDR-TB, although primary resistance can also occur. The global burden of MDR-TB among children is significant but often underreported due to diagnostic challenges. Children with MDR-TB have poorer outcomes compared to those with drug-sensitive TB, largely because of delays in initiating effective therapy and the limited availability of child-friendly formulations of second-line drugs. One of the challenges in diagnosing pediatric TB is its potential to present in unusual or atypical ways. While pulmonary TB is the most common form, disseminated TB can manifest in ways that mimic other diseases. Rarely, TB can involve the extremities, including the small bones of the fingers, known as tuberculous dactylitis. Tuberculous dactylitis, though uncommon, is a form

of osteoarticular TB that affects the small bones of the hands and feet. It is more commonly seen in young children, possibly due to the rich vascular supply to the growing epiphyses, which facilitates bacterial spread. Initial symptoms may include swelling, pain, or deformity of the affected digit, often mistaken for trauma, infection, or other conditions such as juvenile idiopathic arthritis.

## Treatment and preventive measures

Diagnosing disseminated MDR-TB in children is inherently challenging due to nonspecific symptoms, difficulty in obtaining sputum samples, and the limited sensitivity of conventional diagnostic tools. Key diagnostic approaches include, a high index of suspicion is crucial, particularly in children with a known TB contact or those not responding to first-line treatment. X-rays, ultrasound, and CT/MRI scans can help identify disseminated involvement of bones, organs, and lymph nodes. Molecular tests such as Xpert MTB/RIF are essential for detecting *Mycobacterium tuberculosis* and rifampin resistance. Culture and drug susceptibility testing remain the gold standard but are time-consuming. Biopsy of affected tissue may reveal granulomas, aiding in diagnosis. Managing pediatric MDR-TB requires a multidisciplinary approach, including infectious disease specialists, pediatricians, and public health professionals. Key principles include, prompt diagnosis and initiation of appropriate treatment are critical for improving outcomes. Treatment regimens are based on drug susceptibility testing and typically involve second-line drugs such as fluoroquinolones, aminoglycosides, and newer agents like bedaquiline and delamanid. Ensuring adherence to lengthy treatment regimens is essential. Strategies include Directly Observed Therapy (DOT), counseling, and social support. Regular monitoring for drug toxicity and treatment response is necessary, as is follow-up to ensure disease resolution and prevent relapse. Preventing MDR-TB in children involves multiple strategies, such as, identifying and screening contacts of MDR-TB patients is vital for early detection and prevention. Implementing infection control measures in healthcare and community settings can reduce transmission. While the Bacille Calmette-Guérin (BCG) vaccine offers limited protection against TB, it is particularly effective in preventing severe forms like disseminated and meningeal TB in

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children. Addressing the social determinants of health, such as malnutrition and overcrowding, can help reduce TB transmission.

## CONCLUSION

Pediatric multidrug-resistant disseminated tuberculosis is a severe and complex condition that underscores the importance

of early diagnosis, appropriate treatment, and robust public health measures. Atypical presentations, such as involvement of the small bones of the fingers, highlight the need for clinical vigilance and a multidisciplinary approach to care. By improving diagnostic capacity, ensuring access to effective therapies, and strengthening preventive strategies, we can improve outcomes for children affected by this challenging disease.