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Short Communication

Optimizing Pediatric Antiretroviral Therapy Dosing Adherence and Outcomes

Nirantha Chaiyaporn*

Department of Pediatric Infectious Diseases, Chiang Mai Institute of Medical Sciences, Chiang Mai, Thailand

ABSTRACT

Pediatric HIV management remains a pressing global health challenge, particularly in low and middle income countries. While antiretroviral therapy (ART) has significantly improved survival and quality of life, optimizing treatment in children requires careful attention to age appropriate dosing, adherence strategies, and outcome monitoring. Pediatric populations differ physiologically from adults, making pharmacokinetics, drug formulations, and behavioral interventions essential to therapy success. This article explores current challenges and advancements in pediatric ART, focusing on individualized dosing, factors influencing adherence, and long-term treatment outcomes. It emphasizes the need for integrated care models, caregiver education, and child-friendly drug formulations to enhance viral suppression and improve health trajectories for HIV-positive children.

Keywords: Pediatric HIV; Antiretroviral therapy; ART adherence; Dosing challenges; Child-friendly formulations; Viral suppression; Pharmacokinetics; HIV outcomes; pediatric care; HIV resistance

INTRODUCTION

Human Immunodeficiency Virus (HIV) affects over 1.7 million children worldwide, with a majority residing in sub-Saharan Africa and Southeast Asia. The widespread implementation of ART has dramatically reduced HIV-related mortality and morbidity in pediatric populations. However, the unique physiological, developmental, and social characteristics of children present complex challenges in managing HIV effectively. Unlike adults, children require individualized dosing, specific formulations, and consistent caregiver support to ensure adherence and achieve viral suppression. This review highlights the key components of pediatric ART optimization dosing, adherence, and treatment outcomes offering a holistic perspective on improving the quality of life and long-term prognosis for children living with HIV.

DESCRIPTION

Effective ART dosing in children must account for growth and developmental stages, as pharmacokinetics in pediatric patients differ significantly from adults. Drug absorption, metabolism, and excretion vary with age, necessitating precise weight-based or surface area based dosing strategies to ensure therapeutic efficacy without toxicity [1]. Fixed dose combination tablets designed for adults often fail to meet pediatric needs, prompting the development of oral liquids, dispersible tablets, and chewable formulations tailored for younger age groups [2]. Despite these advances, drug availability and affordability remain substantial barriers in low-resource settings.

Adherence to ART is a cornerstone of HIV management, but in pediatric populations, it is particularly complex. Young children depend on caregivers for medication administration, making parental education and support critical [3]. Challenges such as drug palatability, regimen complexity, social stigma, and forgetfulness can lead to poor adherence and virologic failure. Interventions such as counseling, peer support groups, reminder tools, and simplification of regimens (e.g., once-daily dosing) have shown promise in improving adherence rates among children and adolescents [4,5]. A multidisciplinary approach involving pediatricians, social workers, and educators is crucial in sustaining adherence through childhood and adolescence.

Long-term outcomes for children on ART are improving with early diagnosis and treatment initiation. When therapy begins during infancy, children often maintain normal growth, immune

Correspondence to: Department of Pediatric Infectious Diseases, Chiang Mai Institute of Medical Sciences, Chiang Mai, Thailand, E-mail: n.chaiyaporn@cmims-th.org

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recovery, and neurodevelopmental progress [6]. However, prolonged exposure to ART can lead to adverse effects such as mitochondrial toxicity, lipid abnormalities, and potential growth delays, especially in resource-limited settings where monitoring capabilities are restricted [7]. Moreover, resistance to antiretroviral agents, often stemming from inconsistent adherence or poor drug quality, complicates treatment and reduces future therapy options [8].

The emergence of newer agents such as pediatric formulations of dolutegravir has been a milestone in HIV care. Dolutegravir's high resistance barrier, tolerability, and suitability for once daily use make it a favorable option in both initial and salvage therapy for children [9]. Continued pharmacovigilance is needed to monitor long-term safety and effectiveness in pediatric use. Additionally, early infant diagnosis through point of care testing and regular viral load monitoring are crucial tools for managing ART outcomes, yet remain underutilized in many parts of the world.

Psychosocial support must not be overlooked. Children living with HIV often face mental health challenges related to stigma, self-image, and disclosure of their status. As they grow older, transitioning from pediatric to adult care services poses new risks of disengagement from care. Tailored psychological support, disclosure counseling, and structured transition programs can help mitigate these challenges and ensure continuity of care [10].

CONCLUSION

Pediatric ART optimization is a multifaceted endeavor involving accurate dosing, sustained adherence, child-friendly drug formulations, and long-term outcome monitoring. Despite significant advancements, gaps remain particularly in resource-limited environments where delays in diagnosis, inconsistent drug supply, and limited access to child-appropriate formulations hinder progress. Ensuring successful pediatric HIV management requires global cooperation, investment in research, caregiver education, and healthcare system strengthening. Through a comprehensive and child centric approach, it is possible to transform the outlook for HIV-positive children, enabling them to lead healthy, productive lives into adulthood.

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