Opinion

iMedPub Journals
www.imedpub.com

Pediatric Infectious Diseases: Open Access
ISSN 2573-0282

2021
Vol.6 No.1:4

Dosing in Bio-Therapeutics for Children and Body Size

John Derendorf*

Department of Pharmaceutics, University of Florida, Gainesville, FL, USA

***Corresponding author:** John Derendroff

derendorf@ufl.edu

Department of Pharmaceutics, University of Florida, Gainesville, FL, USA

Citation: Derendroff J (2021) Dosing in Bio-Therapeutics for Children and Body Size. Pediatric Infect Dis Vol. 6 No.1:4

Abstract

Although paediatric biotherapeutic doses are frequently calculated using the patient's body weight (mg/kg) or body surface area (mg/m2), linear body size dosage adjustment is extremely empirical. In paediatrics, growth and maturity are also key factors that influence biologic Absorption, Distribution, Metabolism, and Excretion (ADME). The complexity of the parameters involved in paediatric pharmacokinetics necessitates a rethinking of dose adjustment depending on body size. When opposed to no dose adjustment, a proper paediatric dosing adjustment should result in less intersubject variability in the product's pharmacokinetics and/or pharmacodynamics. Small molecules and biological proteins and peptides have a similar pharmacokinetic principle, although the underlying mechanism can be extremely different. For a number of biotherapeutics, paediatric and adult pharmacokinetic properties are compared and summarised. In this review, the impact of body size on paediatric pharmacokinetics for these biological products is examined.

Received: January 08, 2021; **Accepted:** January 18, 2021; **Published:** January 28, 2021

Introduction

Pharmaceutical companies are hesitant to examine medications and biological products in children due to the complexity and costs of paediatric safety and efficacy trials. Physicians are frequently obliged to make empirical assumptions to treat children on a trial-and-error basis due to a lack of safety and efficacy trials in children. In children, the clinical consequences of such interventions can be hopeful, minor, or even dangerous. Drug absorption, distribution, metabolism, and excretion can all be affected by physiological development during childhood. After birth, changes in gastrointestinal absorption, secretion, motility, metabolism, and transport, as well as first-pass effects, will affect drug absorption; changes in body composition, tissue perfusion, and plasma protein binding will affect drug distribution; maturation in cytochrome P450 enzyme-mediated metabolism and phase II metabolism will affect hepatic clearance; and maturation in cytochrome P450 enzyme-mediated metabolism will affect hepatic clearance. Renal clearance will be affected by the maturation of glomerular filtration and renal tubular function.

In general, not all of the effects of maturation on a drug's pharmacokinetics are completely recognised. Drugs are usually administered using one of two dosing strategies: flat fixed dose or body size-based dosing. Body Surface Area (BSA)/body weight adjusted dosage is the most prevalent paediatric dosing method. The same dose is rarely given to small children as it is to adults. Body size-based dosing, on the other hand, typically overlooks a practical dosing technique that can deliver accurate dose and minimal inter subject variability. This method of dosing delivers a predetermined dose for a certain age or body size group. When opposed to body size-based dosing, fixed dosing for a patient group has several advantages, including convenience of preparation and administration, reduced risk of medical errors, improved patient compliance, and cost effectiveness. When the difference between paediatrics and adults can be explained by body weight or BSA adjusted pharmacokinetic characteristics, body weight or BSA dosage adjustment can offer equivalent exposure in paediatrics and adults. This, however, is not always the case. The pattern and magnitude of the pharmacokinetic difference between paediatrics and adults across age groups is frequently unpredictable. When compared to older children or adults, medication clearance and volume of distribution can be higher, but also lower in younger children. As a result, changing the paediatric dose solely based on body weight/BSA may not be an accurate dosing strategy. In paediatrics, age should also be considered while considering maturation. Even when taking age into account for determining doses, all variables connected to different stages of maturation as well as physiological variations between paediatrics and adults may not be correctly accounted for. More importantly, every dosage modification should reduce

the variability in the resulting exposure, demonstrating that it is reasonable to use this dose adjustment.

Unlike adults, children's pharmacokinetics is significantly influenced by their growth and development. The constitution of the body and the function of the organs change as a child grow. Premature or full-term newborns and babies have significantly lower total body water and extracellular fluid levels. Furthermore, fat accounts for 3% of total body weight in premature neonates and 12% of total body weight in full-term neonates; by the age of 4–5 months, it has risen to more than 20%. Protein mass is roughly 20% in infants before they start walking and climbs to 40% in adults. Water makes up around 75% of the weight of lean muscle tissue. As a result, variations in total body water, fat, and muscle at different ages may result in considerable changes in medication distribution volume and systemic concentration.

Drug clearance is influenced by the Glomerular Filtration Rate (GFR). From the age of one to ten days, to one month, and six months, the GFR generally doubles in all three stages. GRF reaches maturity at the age of one year and remains nearly constant from one to 70 years of age. In 130 patients (ages 1-80 years; 40 patients 12 years), the GRF/vECF (Extracellular Fluid Volume) and GRF/BSA ratios were investigated. In the youngsters, neither GFR-based measurement revealed a significant connection with age.