



UMEÅ UNIVERSITET

Umeå University Medical Dissertations, New Series No 2055

The impact of nutrition on growth, biomarkers, and health outcomes in preterm infants

Cornelia Späth

Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av filosofie/medicine doktorsexamen framläggs till offentligt försvar i Stora hörsalen, målpunkt P, byggnad 5B, plan 6, Norrlands universitetssjukhus, fredagen den 29 november, kl. 09:00. Avhandlingen kommer att försvaras på engelska.

Fakultetsopponent: Professor, Deborah O'Connor,
University of Toronto, Toronto, Canada.

Department of Clinical Sciences, Pediatrics

Organization
Umeå University
Department of Clinical
Sciences, Pediatrics

Document type
Doctoral thesis

Date of publication
8 November 2019

Author
Cornelia Spåth

Title
The impact of nutrition on growth, biomarkers, and health outcomes in preterm infants

Abstract

Introduction Nutrients play a crucial role for growth and brain development after preterm birth. Meeting the nutritional needs of preterm infants is challenging. Particularly, the most immature infants have a high risk of malnutrition and poor growth during hospital care. To meet recommended energy and nutrient intakes during early postnatal life, a concentrated parenteral nutrition (PN) regimen was implemented in clinical use in 2012 at the neonatal intensive care unit at Umeå University Hospital (Umeå, Sweden). However, electrolyte homeostasis is labile after preterm birth and infants require an electrolyte supply that corresponds to their energy and protein intakes to avoid electrolyte disturbances. Although sodium imbalances such as hyper- and hyponatremia are common in the most immature preterm infants, there is limited knowledge to what extent these imbalances are affected by fluid volume and sodium supply. Furthermore, it is unclear whether the early high sodium concentrations lead to any adverse effects, including intraventricular hemorrhage, or simply reflect immediate adaptive processes after preterm birth. **Aim** This thesis investigates the impact of nutrition on growth, nutritional biomarkers, and health outcomes in preterm infants born with a birth weight below 1500 g. **Methods** We used data from two study populations. First, we collected data for all very low birth weight infants (< 1500 g) born between 2010 and 2013 and treated at Umeå University Hospital (Umeå, Sweden; n = 134). Second, we used data from the EXtremely PREterm infants in Sweden Study (EXPRESS). We included all infants born before 27 gestational weeks in Sweden between 2004 and 2007 who survived the first 24 h (n = 602). Data collection for both study populations included a) intakes of all parenteral and enteral nutritional products and other fluids during the first 28 postnatal days, b) all anthropometric measurements during hospital stay, c) perinatal data, and d) neonatal morbidity. **Results** The concentrated PN regimen improved early energy and macronutrient intakes in very low birth weight infants. Furthermore, weight and length growth from postnatal week two to a postmenstrual age of 36 weeks improved in very low birth weight infants who received the concentrated PN regimen compared with infants who received the previous original PN regimen (Paper I). Increased parenteral energy and protein intakes provided by the concentrated PN regimen, did not induce a higher occurrence of electrolyte imbalances as electrolytes were supplied according to the current recommendations (Paper II). In the EXPRESS cohort, the majority of extremely preterm infants had hypernatremia during the first and hyponatremia during the second postnatal week. Gestational age and supply of sodium, rather than fluid volume, were the major factors determining the risks of hyper- and hyponatremia (Paper III). High total supply of sodium was significantly correlated with severe intraventricular hemorrhage if mostly mediated by blood product transfusions (Paper IV). **Conclusions** Our results suggest that in very immature preterm infants a concentrated PN regimen improves early nutrient intakes and postnatal growth without causing electrolyte disturbances. Hyper- and hyponatremia are common and the supply of sodium is a major predictor. The impact of sodium on severe intraventricular hemorrhage needs further investigation.

Keywords

Preterm infant, parenteral nutrition, energy intake, nutrient intakes, postnatal growth, electrolyte imbalances, sodium supply, hypernatremia, intraventricular hemorrhage.

Language
English

ISBN
978-91-7855-093-7

ISSN
0346-6612

Number of pages
50 + 4 papers