

Zinc and Nutritional Challenges of Infants

Vadim Ten*

Department of Neonatology, Columbia University, USA

PERSPECTIVE

Zinc is essential for a wide variety of cellular processes in all cells. It is a critical dietary nutrient, particularly in the early stages of life. In the early neonatal period, adequate sources of zinc can be obtained from breast milk. In rare circumstances, the mammary gland produces zinc deficient milk that is potentially lethal for exclusively breast-fed infants. This can be overcome by zinc supplementation to the infant. Alterations to key zinc transporters provide insights into the mechanisms of cellular zinc homeostasis. The bioavailability of zinc in food depends on the presence of constituents that may complex zinc. In many countries, zinc deficiency is a major health issue due to poor nourishment. Young children are particularly affected. Zinc deficiency can impair immune function and contributes to the global burden of infectious diseases including diarrhoea, pneumonia and malaria. Furthermore, zinc deficiency may extend its influence across generations by inducing epigenetic effects that alter the expression of genes. This review discusses the significance of adequate zinc nutrition in infants, factors that influence zinc nutrition, the consequences of zinc deficiency, including its contribution to the global burden of disease, and addresses some of the knowledge gaps in zinc biology.

Nutritional challenges prior to and during gestation, lactation, and early life are known to influence the lifelong health of the infant. The complex relationship between maternal nutritional and birth outcomes emphasizes the need for consistent and thorough assessments of women's diet throughout pregnancy and individualized nutritional education to promote positive birth outcomes. The purpose of this article is to examine the influence of prenatal nutrition on birth outcomes, describe research on the effects of macro- and micronutrients on birth outcomes, and discuss strategies for monitoring diet and implementing nutrition education during pregnancy.

In the past, initiation of nutritional support of very low birth weight (VLBW) infants was delayed because of concerns about the safety of nutrient administration. This contributed to the impairment of neurocognitive development that these infants often display later in life. Today there is consensus that nutritional support of VLBW infants must begin immediately at birth. Because of immaturity of the gastrointestinal tract, nutritional support initially relies mainly on parenteral nutrition. Trophic feedings, preferably in the form of human milk, are provided as a stimulus for maturation of the

gastrointestinal tract. Once maturation has occurred, parenteral nutrition is phased out. Although the objective of nutritional support is to meet the needs of VLBW infants at all times, nutrient deficits, albeit of a modest size, continue to be the rule. Continuing efforts are necessary to eliminate the remaining nutrient deficits.

Nutritionally enhanced enteral feeds during the first month of life appear to have reduced post-discharge morbidity and improved neurological outcomes at two years in VLBW infants. Prevention of unintended adolescent pregnancy is a primary goal of the American Academy of Pediatrics and of many health providers. Nevertheless, many adolescents become pregnant every year in America. Pediatricians therefore should be aware of nutritional recommendations for pregnant adolescents to provide optimal care. The importance of nutrition during pregnancy is here reviewed from a pediatric perspective. Pregnancy, particularly during adolescence, is a time of extreme nutritional risk. The adolescents most likely to become pregnant are often those with inadequate nutritional status and unfavourable socio-economic background. There is increasing evidence of competition for nutrients between the growing pregnant adolescent and her fetus. Also, the prenatal environment has been implicated in the development of obesity, cardiovascular disease, and diabetes in both the mother and her offspring. Many adolescents have poor diet quality and poor knowledge of appropriate nutrition; these habits may not change during pregnancy.

Nutritional support to patients in neonatal and pediatric intensive care units is critical not only to minimize negative nitrogen balance but also to promote growth and development. Continuous technological and logistical advances in the Western countries have improved the efficacy and reduced the complications of parenteral nutrition (PN) to the extent that despite the constraints of cost and infrastructure, PN is now fast growing in India. Although widespread availability is very much desired, it is important that the technique is developed with considerable expertise and used judiciously with full knowledge of its indications, limitations, dangers and benefits. Indications for PN include surgical conditions (short gut syndrome), very low birth weight infants (particularly with necrotizing enterocolitis and surgical anomalies), malabsorption syndromes, conditions requiring bowel rest (acute pancreatitis, severe ulcerative colitis and necrotizing enterocolitis) and several non-gastrointestinal indications (end stage liver disease, renal failure, multiple trauma and extensive burns).

Correspondence to: Vadim Ten, Department of Neonatology, Columbia University, New York, USA, E-mail: vadimt_031@gmail.com

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Provision of PN is associated with significant and sometimes life threatening complications. The possible complications are technical (thrombosis, perforation of vein, thrombophlebitis), infections, metabolic disturbances, hepatobiliary stenosis, cholestasis, fibrosis,

cirrhosis or cholelithiasis and bone related complications like osteopenia and fractures. Meticulous monitoring is necessary not only to detect complications but also to document clinical benefit.