Feeding Strategies of Premature Infants: Is Breast Milk Sufficient in Minimizing Growth and Neurodevelopmental Deficits?

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1. Introduction

Poor growth and development is a common problem in premature neonates and is often associated with subsequent neurodevelopmental delays. These neonates are frequently discharged from the hospital with significant growth deficits and show reduced rates of growth throughout childhood. This observed growth lag has been associated with neurological and sensory handicaps and poor school performance. Interestingly, the period following hospital discharge has been found to be a critical time for influencing the subsequent growth trajectory of the premature neonate. However, nutrition during the post-discharge period has been neglected. In fact, no feeding standard exists today for premature infants following hospital discharge. Many infants are sent home with a diet that consists solely of breast milk. But, breast milk alone does not seem to meet the nutritional needs of this population. Actually, the literature proposes that preterm infants who are exclusively breast fed after discharge show greater developmental deficits, suggesting that these infants would benefit from post-discharge nutritional supplementation. A key question is whether such infants have unique nutritional requirements in the post-discharge period, and whether or not this period is a critical one for later cognition and development. Therefore, the purpose of this study is to assess the efficacy of breast milk in this population, hypothesizing that supplementation of breast milk is required for the adequate brain growth and motor development of premature infants and may provide permanent cognitive benefits across the life span.

2. Methodology

To assess the efficacy of breast milk in this population, a systematic literature review was performed. The review was conducted using the Medline database and included articles from 1990 to the present. Twenty-four articles were reviewed using evidence-based methods. Articles included for review either addressed neonates of less than 37 weeks gestation or who have birth weights of less than 1850g. The inclusion criteria required that each article be a randomized controlled trial, longitudinal study, literature review, or retrospective study. Each article was extracted from a reputable, peer-reviewed journal. Additionally, the articles were chosen based upon how well the data could be extrapolated to the hypothesis in question.

3. Discussion

The findings of this literature review suggest that early nutrition in preterm infants can have a permanent effect on development, stressing the importance of dietary management decisions in this population. In addition, data raises the possibility that preterm infants who are strictly breastfed following hospital discharge require additional nutritional supplementation. In fact, exclusive feeding of un-supplemented breast milk in premature infants was found to be insufficient for adequate nutrient retention and utilization. Interestingly, it was found that most premature babies are fed with supplemented breast milk while in the hospital. Aggressive nutritional management during hospitalization promotes earlier onset of and more rapid rates of postnatal growth of preterm infants, which may be associated with later developmental advantages. However, at discharge, breast milk fortifiers are usually stopped. This practice is associated with poor somatic growth, developmental delays, poor bone mineralization, and insufficient nutrient stores. Because preterm infants accrue significant nutrient deficits during hospitalization, many of these infants have moderate to severe growth failure at the time of discharge. To make matters worse, preterm infants are commonly discharged weighing little more than half the appropriate weight for a term infant at the same postmenstrual age. Additionally, the postnatal period for preterm infants is a critical window for nutrition in terms of later neurodevelopment. In fact, preterm infants are vulnerable to suboptimal early
nutrition in terms of their cognitive performance at 7 ½ - 8 years, which presents a major public health and clinical concern.7

Although adequate nutrition is critical in the care of small preterm infants, no feeding standard exists that is analogous to the breast milk standard for term infants. Human milk is considered to be the best source of nutrition for full-term infants during their first months of life because of the unique nature of its biochemical composition, particularly its immunochemical and cellular components.8 Additional benefits of human milk are an increased host defense, digestion and absorption of nutrients, neurodevelopment, gastrointestinal function, as well as psychological effects on the mother.9 However, some nutrients may be inadequate to support intrauterine rates of growth in small premature infants. Additionally, preterm infants experience physiological and metabolic stresses that can affect their nutritional needs, such as respiratory distress or infection.10 Because the goal for nutritional support is to meet the intrauterine rates of growth and nutrient retention during this time, nutrient supplementation is necessary to optimize the use of human breast milk in the feeding of premature infants. In fact, it has been discovered that preterm infants who are strictly breastfed without supplementation show slower weight and length gains and lower bone mass than infants fed with adequate supplementation.11 The magnitude of the aforementioned growth outcomes in this population demands setting standards for adequate nutrition following hospital discharge. It is likely that nutritional interventions intended to optimize the growth of preterm infants could permanently place these children on a healthier growth trajectory thereby reducing the frequency of growth deficits later in life.12 This has important implications for babies born premature since they have already been predisposed to impaired postnatal nutrition, considerable growth delays, and significant cognitive deficits. The clinical significance of this study is especially important because of the lack of an existing feeding standard in this population.

3. Conclusions

Altogether, fourteen of the articles included in this systematic review qualify as Level I randomized controlled trials. The remaining articles reviewed qualify as Level II and Level III evidence. Based upon the Level I evidence reviewed, a Grade A recommendation for feeding strategies of premature babies can be made with regards to the best utilization of breast milk. These studies consistently demonstrate that nutrient supplementation of breast milk is necessary for adequate brain growth and motor development and may provide permanent cognitive benefits. Therefore, to augment the nutritive value of breast milk while conserving its known protective advantages, supplementation of breast milk should be promoted in the post-discharge period.13 However, one of the limitations of this review is that the evidence is inconsistent in defining the length of time that dietary supplementation is required after discharge to promote the best cognitive and developmental outcomes over time. Because of this, no recommendation can be made at this point regarding the length of dietary intervention. Further studies are required to investigate this period of time. In summary, this literature review provides compelling and consistent evidence extrapolated from randomized controlled trials, which effectively demonstrates significant clinical implications for the care of the infant born preterm.