

Outcomes Associated With Type of Milk Supplementation Among Late Preterm Infants

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ABSTRACT

Objective: To assess whether type of milk supplementation provided to breastfeeding late preterm infants was associated with hospital length of stay (LOS) or breastfeeding status at discharge.

Design: Retrospective chart review.

Setting: Tertiary care teaching hospital in the southern United States.

Participants: Late preterm infants 35 0/7 to 36 6/7 weeks gestational age ($N = 183$) admitted to the mother-baby unit between November 1, 2014, and October 31, 2016.

Methods: The exposure of interest was type of milk supplementation, for example, expressed human milk, pasteurized donor human milk, and formula. Outcomes measured were LOS and breastfeeding status at discharge. Generalized Poisson regression models were used to compare LOS by type of milk supplementation. Modified Poisson regression models were used to estimate risk ratios and 95% confidence intervals for associations with breastfeeding status at discharge.

Results: The LOS for breastfed infants supplemented with expressed human milk and/or pasteurized donor human milk did not differ significantly from exclusively breastfed infants who received no supplement. Exclusively formula-fed infants had longer LOS of 3.2 days compared with 2.6 days for exclusively breastfed infants ($p = .001$). Breastfed infants who received any formula supplementation were 16% less likely to continue breastfeeding until day of discharge compared with breastfed infants who received human milk supplementation (risk ratio = .84, 95% confidence interval [.77, .92]).

Conclusion: The high prevalence of supplementation among breastfeeding late preterm infants underscores the potential effect of type of milk supplementation on LOS and breastfeeding outcomes. Our findings suggest that human milk supplementation discourages transition to formula feeding before hospital discharge without increasing LOS.

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Late preterm infants (LPIs) born between 34 and 36 6/7 weeks gestational age are at increased risk of morbidity and mortality (Academy of Breastfeeding Medicine [ABM], 2016). Approximately 9.6% of U.S. births are preterm (<37 weeks), and approximately 72% of those births are defined as late preterm. This figure represents almost 275,000 of the nearly 4 million annual births in the United States (Martin, Hamilton, Osterman, Driscoll, & Matthews, 2017). Much of the increased morbidity and mortality in LPIs is related to feeding difficulties. Effective oral feeding behavior is dependent on the physical maturity of the infant's brain. Because one third of a neonate's brain develops between 35 and 41 weeks gestation (Hallowell &

Spatz, 2012), many LPIs are born with immature neurological systems, which results in inconsistent sleep/wake cycles and observable feeding cues and fatigue while feeding at the breast (Briere, Lucas, McGrath, Lussier, & Browne, 2015; Cartwright, Atz, Newman, Mueller, & Demirci, 2017). Late preterm infants may also be similar in birth weight to healthy, term infants, which leads families and health care providers to assume that they can be treated in the same way as term newborns. In reality, LPIs are at increased risk of respiratory distress, poor thermoregulation, decreased stamina and alertness, and weaker sucking and ineffective milk transfer at the breast, all of which can increase the risk of hypoglycemia, hyperbilirubinemia, weight loss,

Late preterm infants need human milk for optimal growth and brain development but are at increased risk of poor breastfeeding and shorter breastfeeding duration.

delay of discharge, hospital readmission after discharge, and breastfeeding failure (Adamkin, 2006; Boyle et al., 2015).

Whereas breastfeeding, or human milk-feeding, is recommended for all infants (excluding contraindications) for the first 1 to 2 years of life, it is even more important for optimal growth and brain development in preterm infants (American Academy of Pediatrics [AAP], 2012; Briere et al., 2015). Exclusively breastfed infants have increased white-matter development in several brain regions that affects cognitive and behavioral outcomes (Deoni et al., 2013). One theory is that human milk is responsible for the difference in brain development, particularly the long-chain polyunsaturated fatty acids that infants accrue rapidly in their brains during the last trimester of pregnancy (Hallowell & Spatz, 2012). Because preterm infants are born before brain growth is complete, they are even more reliant on the human milk fatty acids in their diets. In addition, preterm infants who are not fed human milk diets are at significantly increased risk of necrotizing enterocolitis, sepsis, gastrointestinal and respiratory infections, sudden infant death syndrome, and a greater number of hospital readmissions in the first year of life (AAP, 2012).

Optimal care to promote breastfeeding during the birth hospitalization includes skin-to-skin contact, early initiation of breastfeeding, rooming-in or nonseparation of mother and newborn, limiting formula supplementation, and provision of skilled lactation support (Munn, Newman, Mueller, Phillips, & Taylor, 2016; World Health Organization, 1991). These practices are even more important for mothers of LPIs who may have delayed lactogenesis or experience challenges with initiation of breastfeeding (Meier, Furman, & Degenhardt, 2007). Because LPIs are at increased risk of poor breastfeeding, they are even more likely to receive formula supplementation and to have shorter duration of breastfeeding (Nyqvist et al., 2013). Although optimal breastfeeding practices are helpful, LPIs also require closer monitoring of feedings to ensure adequate intake, and mothers need skilled support to protect their milk supplies for long-term breastfeeding (Sables-Baus et al., 2013).

Mothers of LPIs often need to initiate milk expression in the hospital for supplemental feedings until their infants mature enough (38–40 weeks gestational age) to effectively breastfeed consistently (Briere et al., 2015). Some hospitals have policies to define medical indications for supplementation of breastfed infants, particularly for newborns on a mother-baby unit, starting first with mother's own expressed milk and then the use of formula (Mattsson, Hamilton, Osterman, Driscoll, & Matthews, 2015). Many medical organizations and protocols recommend supplementation with expressed mother's own milk as available and then pasteurized donor human milk (PDHM) to improve outcomes and avoid formula supplementation (AAP, 2012; ABM, 2016; Association of Women's Health, Obstetric and Neonatal Nurses, 2014). Use of PDHM is the standard of care in most U.S. NICUs for very-low-birth-weight infants, yet PDHM is not routinely recognized as an option for medically indicated supplementation of term or late preterm infants (Briere et al., 2015).

Briere et al. (2015) described actual hospital policies that may exclude LPIs from receipt of PDHM. Several researchers who studied LPIs and breastfeeding outcomes reported the use of formula for supplementation as the only option after expressed mother's milk (Gianni et al., 2016; Goyal, Attanasio, & Kozhimannil, 2014; Mattsson et al., 2015). Many clinical protocols or guidelines for breastfeeding LPIs contain recommendations for the use of PDHM when supplementation is medically indicated, but no published research is referenced to support this recommendation (AAP, 2012; ABM, 2014, 2016; Meier, Patel, Wright, & Engstrom, 2013). In their overview of policy statements and practice guidelines related to breastfeeding LPIs, Briere et al. (2015) concluded that more research was needed to establish the use and benefits of donor milk for supplementation when a mother's own milk was not available. Last, the U.S. Surgeon General called for development of evidence-based clinical guidelines for the use of banked donor milk, particularly in infants with low or very low birth weight or prematurity (U.S. Department of Health and Human Services, 2011). To address these research gaps, we examined the type of milk provided to LPIs admitted to a mother-baby unit, including supplementation with PDHM, expressed human milk, and formula. The primary aim of our study was to evaluate whether length of stay (LOS) in the hospital differed by the type of supplemental milk provided. We also

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