A Population-Based Cohort Study of Breastfeeding According to Gestational Age at Term Delivery

Olha Lutsiv, BHSc[1], Lucia Giglia, MSc, MD[2], Eleanor Pullenayegum, PhD[3,4], Gary Foster, PhD[3,5], Claudio Vera, MSc, MD[6], Barbara Chapman, BScN[7], Christoph Fusch, MD, PhD[8], and Sarah D. McDonald, MSc, MD[3,9]

Objective Because breastfeeding is the optimal form of infant feeding, this study was conducted to determine the effect of gestational age on breastfeeding in term infants.

Study design A retrospective population-based cohort study of singleton/twin hospital births was conducted in Ontario, Canada between April 1, 2009, and March 31, 2010. Multivariate logistic regression was used to determine the adjusted effect of gestational age on breastfeeding.

Results Our study population comprised 92 364 infants, of whom 80 297 (86.9%) were exclusively or partially breastfed at the time of hospital discharge. Multivariate logistic regression analyses demonstrated that early-term infants had lower odds of being breastfed compared with infants born at 41 weeks gestation (40 weeks: aOR, 0.93; 95% CI, 0.86-0.99; 39 weeks: aOR, 0.87; 95% CI, 0.81-0.93; 38 weeks: aOR, 0.81; 95% CI, 0.75-0.88; 37 weeks: aOR, 0.74; 95% CI, 0.67-0.82).

Conclusion Using a population-based approach, we found that infants born at 40, 39, 38, and 37 weeks gestation had increasingly lower odds of being breastfed compared with infants born at 41 weeks. Clinicians need to be made aware of the differences in outcomes of infants delivered at early and late term, so that appropriate breastfeeding support can be provided to women at risk for not breastfeeding. *(J Pediatr 2013;163:1283-8).*

Although preterm birth is a well-recognized contributor to serious neonatal, infant, child, and maternal morbidity and mortality, recent studies have shown that health outcomes according to gestational age fall on a continuum, with early-term infants (37 0/7-38 6/7 weeks gestational age) also experiencing significantly greater risks of morbidity and mortality compared with those born at later term.[1,2] These risks contribute to adverse health outcomes during infancy, such as respiratory disorders and increased hospital admissions.[1,2] Owing to continuing brain development in early term infants, adverse effects have been found to extend beyond the neonatal period, affecting school performance.[3] The impact of early-term birth on breastfeeding remains to be established.

Although the greatest health benefits of breastfeeding are observed with exclusive breastfeeding of at least 6 months duration, there is a dose-response relationship in terms of both quantity and duration of breastfeeding,[4,5] with demonstrated reductions in morbidity associated with any breastfeeding, even if not exclusive.[6,7] Because some women may be unable to breastfeed exclusively and thus will opt for supplemented breastfeeding, it is important to study the predictors of breastfeeding, both exclusive and supplemented, as well as the risk factors associated with a lack of breastfeeding.

The majority of studies on breastfeeding are based on self-administered surveys, and as such are prone to selection, volunteer, and recall bias. Additional, methodologically sound research is needed to determine the true prevalence of breastfeeding.[8] In the present study, we investigated the impact of gestational age on breastfeeding at the time of maternal-infant discharge from the hospital.

Methods

This retrospective population-based cohort study was conducted following the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.[9] This is part of a series of population-based studies on breastfeeding; the details of the first study, which focused on exclusive breastfeeding at hospital discharge, have been reported previously.[10] The McMaster University Research Ethics Board approved this study.

Data for this study were from Better Outcomes Registry and Network (BORN) Ontario,[11] an information system that captures population-based information on all hospital births in Ontario, Canada. To maintain high data quality,

BORN	Better Outcomes Registry and Network

logic-checking mechanisms were built into the database to minimize missing/erroneous information, and formal training was mandatory for all new users. A recent quality audit of BORN data found that the percent agreement with chart data was typically in the mid to high 90s for the variables included.[12]

The study population comprised live singleton and twin births at term (37 0/7-41 6/7 weeks gestation) occurring between April 1, 2009, and March 31, 2010, with recorded information on feeding at maternal-infant discharge. Neonatal deaths and infants with congenital anomalies were excluded, as were infants discharged to another hospital or from a neonatal intensive care unit (data for whom are not available in the BORN database). Owing to high correlation of outcomes within paired individuals, 1 member of each twin pair was excluded at random as well.

The primary exposure was week of gestation at delivery. The primary outcome was any breastfeeding at maternal-infant discharge from hospital, defined as either exclusive or supplemented breastfeeding. Information relating to breastfeeding status was entered into patients' charts by nurses in the postpartum units before maternal-infant discharge, and this information was then entered either electronically or manually into the BORN database. To analyze the independent effect of gestational age at birth on breastfeeding in term infants, we controlled for confounding variables, including (1) maternal, antenatal, and healthcare provider variables (age, median neighborhood family income, and employment rate [defined according to Statistics Canada census data[13] based on postal code], having a previous term or preterm baby, smoking, illicit drug use, physical or mental health problems, twin pregnancy, use of assisted reproductive technology, obstetrical/pregnancy complications, attendance at prenatal classes, and type of antenatal care provider); (2) hospital and delivery variables (type of hospital characterized by the level of care designations,[14] defined based on the most acute level of care a hospital would typically provide [level 1: care of mothers with healthy pregnancies and their infants, birth at ≥36 weeks; level 2: care of mothers with low-to-moderate risk pregnancies and their infants, birth at ≥32 weeks; level 2+: care of mothers with moderate risk pregnancies and their infants, birth at 30-32 weeks; level 3: subspecialty care for high-risk pregnancies, mothers with severe medical complications, unwell/unstable newborns, multiple pregnancies of triplets and higher order multiples, birth at <32 weeks], maternal pain relief, and intrapartum complications); and (3) other infant predictor variables (birth weight, sex, Apgar score at 5 minutes, cord blood pH, and newborn resuscitation).

Infants who were breastfed at hospital discharge were compared with infants who were not breastfed using descriptive statistics for baseline characteristics. Univariate logistic regression was performed, followed by multivariate logistic regression, adjusting for all variables, to yield aORs for any breastfeeding according to gestational age at delivery. To minimize any correlations between study participants, data for a single year were used to reduce the likelihood of any

given woman having more than 1 pregnancy included in the data, and 1 member of each twin pair was excluded. Multiple imputation was used to correct for missing data on predictor variables in the logistic regression analyses.[15,16] A sensitivity analysis comparing results with and without multiple imputation revealed no significant differences.

The a priori sample size calculation for the initial study in this series, which focused on exclusive breastfeeding,[9] determined an 80% power to detect relative risks as small as 1.3 that are associated with rare occurrences (eg, twins, ~2% incidence). With any breastfeeding, a slightly lower power to detect the same relative risk would be expected, because any breastfeeding (both exclusive and supplemented breastfeeding) was more common than exclusive breastfeeding. Statistical analyses were performed using SAS version 9.2 (SAS Institute, Cary, North Carolina).

Results

Of the 92 364 infants in our study population, 80 297 (86.9%) were exclusively or partially breastfed at hospital discharge (Figure 1). Baseline characteristics of the mothers with and
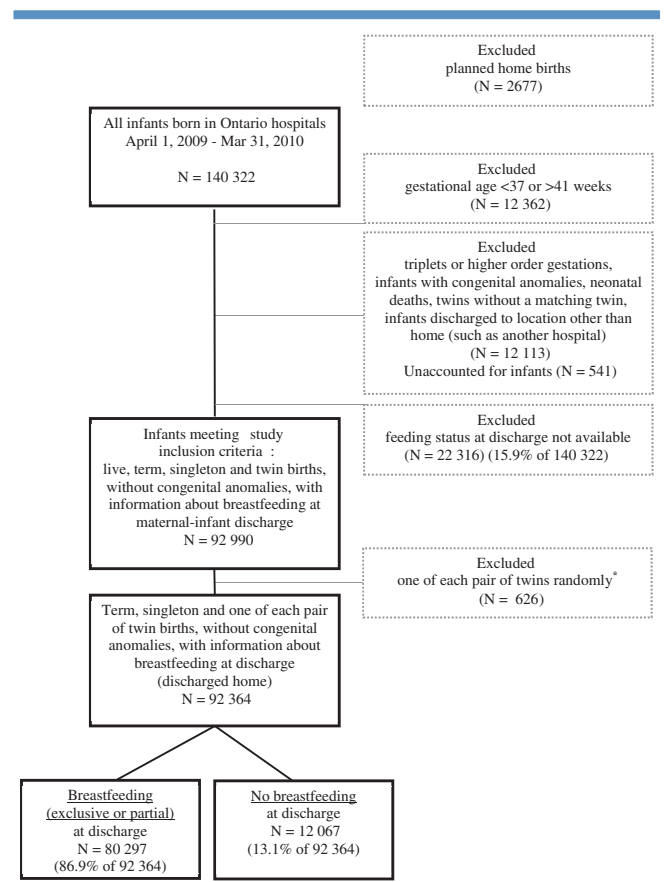
Figure 1. Flow chart of subject selection. *One of each pair of twins was excluded randomly to maintain statistical independence and prevent high correlation.