Comparison of Feeding Among Multiple Birth Infants

Sheela R. Geraghty, Jane C. Khoury, and Heidi J. Kalkwarf

Division of General and Community Pediatrics, Cincinnati Children's Hospital Medical Center, University of Cincinnati, Ohio, United States of America

Mothers of multiples who choose to feed their infants breast milk are faced with a seemingly overwhelming set of circumstances. Since mothers of multiples could potentially feed their infants differing proportions of breast milk, current methods of obtaining breastfeeding data for mothers of singletons may not adequately describe the breastfeeding behaviors of mothers of twins and triplets. The goal of our study was to determine the proportion of breast milk each infant of a multiple set was fed over a six-month period and compare the feeding regimens of sibling infants. Results of this retrospective study based on maternal reports indicated that there was almost complete agreement in the proportion of breast milk fed to siblings born from the same pregnancy, regardless of stratification based on gestational age, plurality, or location of the infants (hospital vs. home). The Pearson correlation coefficient for duration of breast-milk feeding between sibling twins was 0.99 ($p < .0001$); among sibling triplets the values were .97, .98 and .99 ($p < .0001$). A better understanding of the process by which twins and triplets are fed breast milk sets the stage for future research and can ultimately lead to the development of strategies to increase breast-milk feeding rates for multiple birth children.

When mothers of multiples choose to feed their infants breast milk, they are faced with a seemingly overwhelming set of circumstances. Difficulties with breastfeeding multiples include insufficient prenatal and early postpartum breastfeeding education and support, delayed lactogenesis, insufficient milk supply, problems with latch and positioning, profound maternal fatigue, and parental mental health issues (Flidel-Rimon & Shinwell, 2002; Gromada & Spangler, 1998; Hattori & Hattori, 1999; Leonard, 2000, 2002; Sollid et al., 1989). In addition, approximately 60% of twins and 90% of higher-order multiples (triplets or more) in the United States are born at less than 37 weeks gestation (Arias et al., 2003), and premature multiples often experience medical complications that potentially interfere with breastfeeding (Keith et al., 2000; Nyqvist, 2002; Shinwell, 2002). In 2003, Leonard utilized the framework developed in the *Declaration of Rights and Statement of Needs of Twins and Higher Order Multiples* (Council of Multiple Birth Organization of the International Society for Twin Studies, 1995) to outline breastfeeding rights of multiple birth families (Leonard, 2003). The author acknowledged that even though breastfeeding multiples is inherently challenging, families deserve 'sustained assistance from health care providers who are encouraging, knowledgeable, skilled, and committed to the breastfeeding of multiple children' (Leonard, 2003). Leonard's benchmark paper is not only invaluable for its thorough compilation of the literature on the topic; it provides a structured framework in which to pose research questions related to breastfeeding and multiple birth infants.

One of the fundamental challenges to conducting research on the feeding of multiple birth infants is determining what is meant by the terms *breastfeeding multiples* and *breast-milk feeding rates of multiples*. With singletons, the breastfeeding classification of the nursing dyad is reciprocal; if an infant is fed breast milk, the mother is considered to have breastfed. This data is used to determine breastfeeding rates. For instance, the Centers for Disease Control and Prevention recently reported breastfeeding rates of women in the United States after mothers of 19- to 35-month-old children were asked if a specific child was ever breastfed or fed breast milk (Grummer-Strawn & Li, 2000). This currently accepted method of data collection and reporting cannot be used for mothers of multiples, however, as it may not adequately describe the breastfeeding, or more specifically, the breast-milk feeding, behaviors of mothers of twins, triplets, or more. A mother of multiples may indicate that she is breastfeeding but it may not necessarily follow that all infants are receiving

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Address for correspondence: Sheela R. Geraghty, Division of General and Community Pediatrics, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave. MLC 7035, Cincinnati, Ohio 45229–3039, USA. E-mail: sheela.geraghty@chmcc.org

some breast milk or that each is receiving the same proportion of breast milk as their co-multiple(s).

When national breastfeeding standards are not met, researchers and the health care community are able to work together to identify and devise strategies to help increase breastfeeding rates. A better understanding of the process by which multiple birth infants are fed can facilitate future research studies and ultimately lead to the development of strategies to increase the breast-milk feeding rates of multiple gestation infants. The goal of this study was to provide a greater understanding of the feeding choices made by mothers of multiple gestation infants. We wanted to determine the proportion of breast milk fed to each of the infants during the first six months postpartum and to compare the siblings' feeding regimens to see how similar or disparate the feeding of each multiple within a set was.

Materials and Methods

This study was part of a larger project designed to compare the rates of breast milk and formula feeding of four distinct groups: mothers of full term (37 weeks gestation) singletons, mothers of preterm (27 to 37 weeks gestation) singletons, mothers of full term multiples and mothers of preterm multiples (Geraghty et al., 2004). Since the aim of this report was to describe the type of milk fed to sibling multiples, we are presenting data on the mothers of multiples only. To obtain names of potential participants for the study, we used a computerized database of recorded births in the area surrounding Cincinnati, Ohio, USA. We chose this region since it includes the Cincinnati Children's Hospital Medical Center where the study was being conducted. We used birth certificate data from 1999 which became available to us in September, 2001. The Child Policy Research Center housed at Cincinnati Children's Hospital Medical Center gave us the public domain birth certificate information of 341 randomly selected mothers of multiples. In January, 2002, we sent a mailed letter to these mothers. All children were between two and three years old by this time. Mothers were asked to send back to us a signed letter indicating that they would like to participate. All mothers who agreed to be in the study were eligible except when there was discordance in the number of infants born on the identified date and the number of infants that still lived with the mother. This exclusion criterion was necessitated by the fact that one or more infants of a multiple set may have died in the neonatal period. Mothers not eligible by this criterion received a letter thanking them for their offer to be in the study with an explanation of their ineligibility. In an attempt to encourage participation, the introductory letter was sent to mothers up to three times. A toy store gift certificate of $10 was offered to each mother upon completion of the study. This study and method of participant selection was approved by the Institutional Review Boards at Cincinnati Children's Hospital Medical Center and the University of Cincinnati College of Medicine.

There were two phases to the data collection for this study: a self-administered questionnaire and a structured telephone interview. Details of tool development, including reliability and validity are described elsewhere (Geraghty et al., 2004). Mothers who agreed to be in the study were mailed the self-administered questionnaire, which included questions about the perinatal history. Information about infertility issues was not sought. Every mother who fed breast milk to one or more of her infants received a follow-up telephone interview which was conducted by a trained research assistant. Since it is common practice that preterm infants are fed pumped breast milk through a bottle or nasogastric tube, we told the participants that instead of the term *breastfeeding* we were going to use the terminology *breast-milk feeding*. This meant that any breast milk fed directly at the breast or expressed then given by any other method such as a bottle, cup, or feeding tube was to be considered breast-milk feeding. We asked mothers to recall the proportion of breast milk that they fed to each of their infants at the following postpartum times: 24 hours, three days, two weeks, and the end of months one, two, three, four, five and six. At each time period, mothers were asked to choose from the following categories of milk feeding: all breast milk, mostly breast milk/some formula, about half formula/half breast milk, mostly formula/some breast milk, all formula, or the infant did not receive any form of milk (i.e., for those infants early in the postpartum period who were not ready for enteral feedings). Our goal was to estimate the proportion of breast milk versus infant formula fed to each infant regardless of the route of feeding (i.e., at the breast or expressed and fed by bottle). The research assistant asked an identical set of questions for each of the sibling infants of a multiple birth pregnancy. Mothers who initiated breast-milk feeding were asked for the total weeks' duration that breast milk was fed to each of the infants. We did not collect information on the feeding of solid foods or the circumstances with respect to weaning.

Data were managed and analyzed using SAS version 8.1 (SAS, 2000). Periodically throughout the study we generated frequency distributions for all variables in both the mailed and telephone surveys to examine characteristics of the sample and identify potential errors in coding and data entry. We determined the proportion of at least some breast-milk feeding during the first six months for each infant of a multiple set regardless of the method that the breast milk was fed (at the breast vs. expressed and placed into a bottle). We utilized the kappa statistic to calculate the agreement in the categories of milk fed to sibling twins and triplets throughout the first six months postpartum. Separate kappa statistics were run based on: (1) length of pregnancy (term vs. preterm); (2) plurality (twins vs. triplets); and (3) location of the

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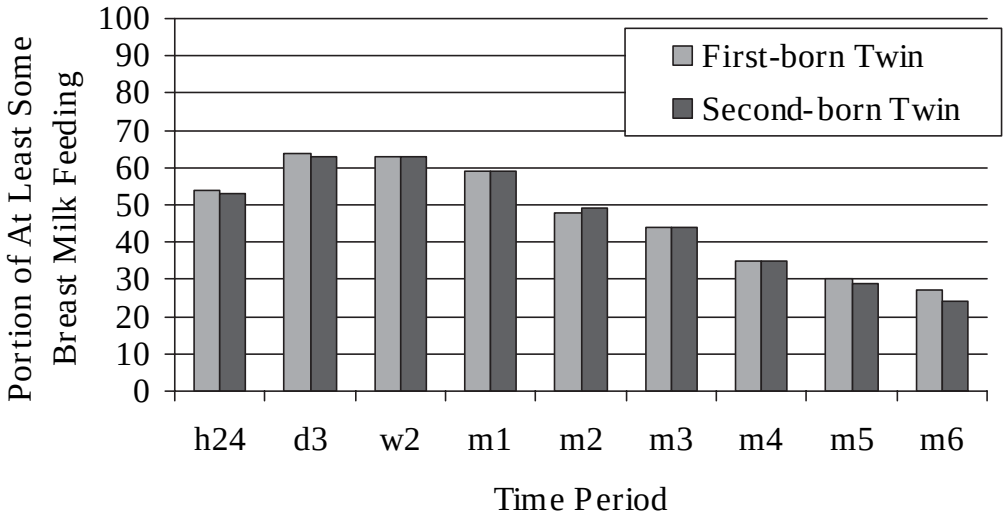

Figure 1

Proportion of first-born (n = 171) and second-born (n = 171) twins that were fed at least some breast milk by time period.

infants (all in hospital, all the infants at home, or when the infants were in separate locations.) We then used the Pearson correlation coefficient to compare the number of weeks sibling multiples were fed at least some breast milk. The data for the time-points when a mother reported an infant was not fed any enteral nutrition were not included in the analysis.

Results

Of the 341 letters sent to mothers of multiples, 45 were returned unopened with no verifiable forwarding address. Eighty-six mothers never responded. The signed consent form was sent back by 210 mothers of multiples (61.6%). Four mothers who wanted to participate were ineligible because each had one infant of a twin pair die prior to study enrolment. One hundred and eighty-five mothers of multiples completed the study; 90 gave birth to term multiples and 95 had preterm multiples. There was one mother of triplets in the term multiple group, and 13 mothers of triplets in the preterm multiple group. Of the mothers of multiples, 91% were Caucasian, 90% were married, 62% had a household income greater than US$55,000 per annum, 52% graduated from college, 55% had Cesarean section deliveries, and 39% went back to work by six months. The mean age of the mothers of multiples was 31 years (SD = 5.0 years). From the original birth certificate data we were able to select demographic characteristics of the nonparticipants. When comparing the responders and nonresponders of the entire study, which included mothers of both singletons and multiples, nonresponders were younger (26 ± 6.2 vs. 30 ± 5.6 years, p < .0001), less likely to be Caucasian (72% vs. 91%, p < .0001), infrequently college graduates (18% vs. 48%, p < .0001), and fewer were married (54% vs. 84%, p < .0001).

The mean birth weight for term infants was 2857g (SD = 428g), and the mean birth weight for preterm infants was 2171g (SD = 504g). Seven mothers of preterm twins reported that neither of their infants were fed any form of milk at 24 hours of life, and two mothers of preterm twins said that neither of their infants received any form of milk at three days. All infants in the study were being fed some type of milk by two weeks postpartum. Figure 1 illustrates the proportion of first-born twins (n = 171) and second-born twins (n = 171) fed at least some breast milk during the first six months of life.

By three days of life, 64% of first-born twins and 63% of second-born twins were fed at least some breast milk. While these proportions remained similar throughout the first month of life, breast-milk feeding rates of both first- and second-born twins steadily declined thereafter. By six months, about 25% of the twin infants received at least some breast milk. The proportions of at least some breast-milk feeding of the first- (n = 14), second- (n = 14), and third-born (n = 14) triplets, respectively are illustrated in Figure 2.

Although approximately 55% of the triplets received at least some breast milk within the first month of life, by six months only about 15% of triplets in the study were fed any breast milk. The median length of time that at least some breast milk was fed to the first-born twin was 16 weeks and for the second-born twin 15 weeks. For the triplets, the median length that at least some breast milk was fed to the first- and second-born triplets was 13 weeks,

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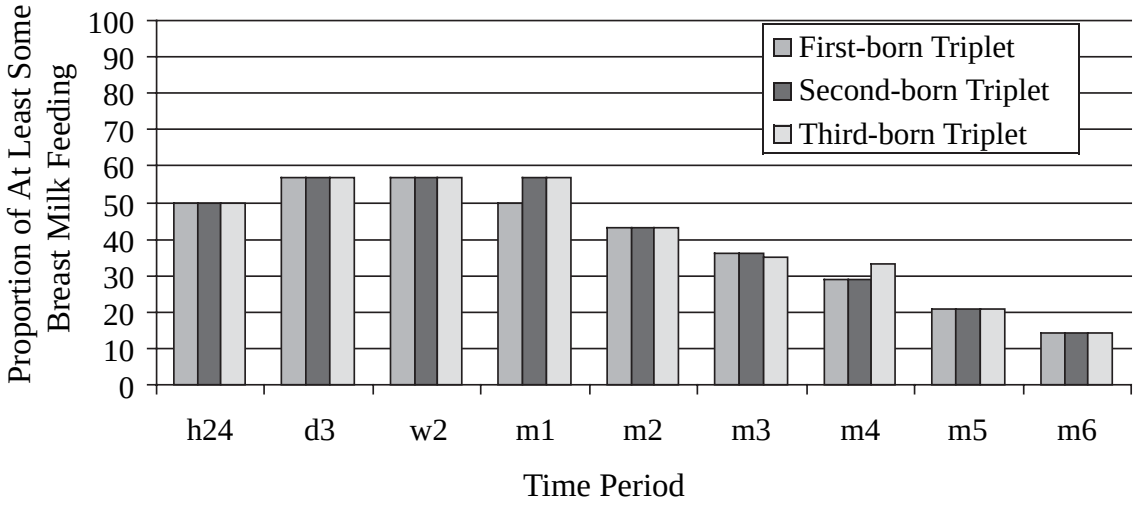

Figure 2

Proportion of first- ($n = 14$), second- ($n = 14$), and third-born ($n = 14$) triplets that were fed at least some breast milk by time period.

and for the third-born triplet the duration was 14 weeks. At one month postpartum 33% of term multiples and 25% of preterm multiples received exclusive breast-milk feedings whereas at 6 months the rate had decreased to 13% and 2%, respectively (Geraghty et al., 2004).

The kappa statistics reflecting the degree of agreement in milk type (all breast milk, mostly breast milk/some formula, about half formula/half breast milk, mostly formula/some breast milk, all formula) based on 1) length of pregnancy (term vs. preterm); 2) plurality (twins vs. triplets); and 3) location of the infants (all in hospital, all the infants at home, or when the infants were in separate locations) are shown in Table 1.

There was almost complete agreement in the proportion of breast milk fed to sibling infants. The Pearson correlation coefficient for duration of breast-milk feeding between sibling twins was .99 ($p < .0001$); among sibling triplets the values were .97, .98 and 0.99 ($p < .0001$). Despite the potential differences when feeding multiples, siblings of a multiple set were fed the same proportion of breast milk and infant formula during the first six months postpartum and weaned from breast milk at the same time.

Discussion

To our knowledge, this is the first study to compare the proportion of breast milk fed to sibling infants born from the same pregnancy. The results suggest that mothers of multiple birth infants did not make discrepant feeding choices over the first six months postpartum. We found that sibling multiple birth infants were fed almost the same proportion of breast milk whether they were preterm, twins or triplets, or in the same or different locations (i.e., one in the hospital and one at home). Those who were fed breast milk were weaned at the same time as their multiple birth sibling(s). This latter finding is in contrast to the weaning times of higher-order multiples reported elsewhere (Auer & Gromada, 1998; Leonard, 2000; Mead et al., 1992).

While the main focus for this study was to compare the type of milk fed to sibling multiple gestation infants, the data collected provides the opportunity to compare the proportion of breast-milk feeding by the 185 mothers of multiples in this study to US breastfeeding recommendations. The breastfeeding goals outlined in *Healthy People 2010* are that 75% of all women breastfeed their infants in the early postpartum period and 50% of all women breastfeed at six months postpartum (US Department of Health and Human Services, 1990). When comparing the prevalence of breast-milk feeding practices of mothers in our study to this US recommendation, it is evident that the multiple birth mothers did not meet the recommended goals. At three days postpartum, 63% of twin mothers were feeding breast milk to their infants, and only 57% of mothers of triplets were doing so. At six months, only about 25% of twin mothers and 14% of triplet mothers were feeding at least some breast milk to their infants. Our findings highlight the need to identify the most pressing obstacles to providing breast milk to multiple birth infants and to develop interventions to overcome them.

One of the main limitations of this study is that we collected infant feeding data retrospectively. We surveyed mothers when their infants were between two and three years of age. Even though US national breastfeeding rates currently are being reported based on recall of caregivers of 19- to 34-month-old chil-

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Table 1

Kappa Measures of Agreement in Infant Feeding of Sibling Multiples Stratified by Length of Pregnancy, Plurality and Location of Infants by Time Period

Time	Gestational age		Plurality		Location		
	Term	Preterm	Twins	Triplet	All in hospital	All at home	In two places
24 hrs	0.91	0.90	0.96	0.97	0.90	p 1.0	n/a
3 days	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2 wks	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Month 1	1.0	0.98	1.0	0.95	1.0	1.0	n/a
Month 2	0.98	0.98	0.99	0.97	n/a	0.99	1.0
Month 3	1.0	0.96	0.99	0.95	n/a	1.0	n/a
Month 4	1.0	0.98	1.0	0.93	n/a	0.99	n/a
Month 5	0.98	1.0	0.98	1.0	n/a	0.99	n/a
Month 6	0.92	0.91	0.97	1.0	n/a	0.93	n/a

dren (Li et al., 2003) and there have been several studies that cited maternal recall of infant feeding events as accurate years later, (Githens et al., 1993; Launer et al., 1992; Wereszczak et al., 1997; Yawn et al., 1998) this previous and ongoing work includes only mothers of singletons. We did ask the mothers of multiples in our study an identical set of questions for each of their infants. Although during the interview process mothers remarked how vividly they recalled this time-point in their infants' lives, it is not known if mothers confused some of the feeding history of one infant with another or one time-point with another. To ascertain the extent of potential recall bias in mothers of multiples, careful records would have to be collected prospectively on the feeding regimen of each infant, then compared to maternal responses years later.

Need for More Research

One of the fundamental challenges to conducting research on the feeding of multiple birth infants is determining what is meant by the terms breastfeeding multiples and breast-milk feeding rates of multiples. Although the current method of obtaining breastfeeding data for mothers of singletons does not completely describe the behavior of mothers of multiples, with more detailed questioning, breastfeeding rates, or more accurately, breast-milk feeding rates, of mothers of multiples can still be obtained. This study needs to be repeated in other geographic regions and cultures to determine whether the patterns of infant feeding of multiples are similar to those found in this study. Perhaps, then, a more useful nomenclature defining the breast-milk feeding practices of mothers of multiples can be adopted.

The aim of our study was to describe and compare breast-milk feeding among mothers of twins and triplets. Our study was not designed to describe the daily breast-milk feeding routines of mothers of multiples. To more thoroughly guide parents and healthcare workers, more research is needed with large groups of mothers of multiples in order to provide more details about daily breast-milk feeding routines. This would include the usual number of breast-milk feedings, frequency of milk expression versus feeding directly at the breast, choice of feeding multiples at both breasts simultaneously or one after another, and the utilization of scheduled versus demand feeding. These determinants undoubtedly influence a mother's choice to feed breast milk or infant formula and when to wean. Leonard's seven multiple birth breastfeeding rights clearly outline best practice guidelines for those involved with the care of multiples, yet there is still a need for an evidence-based approach to the successful feeding of breast milk to these infants. As Leonard states, 'even though the body of research and empirical evidence regarding the breastfeeding of multiple and preterm infants is growing, there are substantial gaps' (Leonard, 2003). As we strive to fill in these gaps, we must continually develop new research questions that will help us more effectively to teach and more successfully to establish a nurturing environment that encourages more mothers of multiples to feed their infants breast milk.

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