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Breastfeeding Practices Among First-Time Mothers and Across Multiple Pregnancies

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Abstract

To investigate maternal characteristics associated with breastfeeding initiation and success. Women enrolled in the Mothers Outcomes After Delivery study reported breastfeeding practices 5–10 years after a first delivery. Women were classified as successful breastfeeding initiators, unsuccessful initiators, or non-initiators. For the first birth, demographic and obstetrical characteristics were compared across these three breastfeeding groups. For multiparous women, agreement in breastfeeding status between births was evaluated. Multivariate regression analysis was used to identify characteristics associated with non-initiation and unsuccessful breastfeeding across all births. Of 812 participants, 740 (91%) mothers tried to breastfeed their first child and 593 (73%) reported breastfeeding successfully. In a multivariate analysis, less educated women were less likely to initiate breastfeeding (odds ratio (OR) for non-initiation 1.97; 95% confidence interval (CI) 1.23, 3.14). There was a notable decrease in breastfeeding initiation with increasing birth order: compared to the first birth, the odds for non-initiation after a second delivery almost doubled (OR 1.83, 95% CI 1.42, 2.35) and the odds for non-initiation after a third delivery were further increased (OR 2.44, 95% CI 1.56, 3.82). Successful breastfeeding in a first pregnancy was a predictor of subsequent breastfeeding initiation and success. Specifically, women who did not attempt breastfeeding or who reported unsuccessful attempts to breastfeed at first birth were unlikely to initiate breastfeeding at later births. Cesarean delivery was not associated with breastfeeding initiation (OR 1.01; 95% CI 0.68, 1.48) or success (OR 1.33; 95% CI 0.92, 1.94). Breastfeeding practices after a first birth are a significant predictor of breastfeeding in subsequent births.

Keywords

Breastfeeding initiation; Cesarean delivery; Multiparity; Maternal education; Healthy People 2020

Introduction

The public health benefits of breastfeeding are well-documented [1–3]. Most medical and public health organizations, including the American Congress of Obstetricians and Gynecologists [4], the American Academy of Pediatrics [1] and the World Health Organization [5], recommend breastfeeding for all infants, with 6 months of exclusive breastfeeding as a goal. From an economic perspective, the incentives to encourage breastfeeding are strong: if 90% of US women breastfed exclusively for 6 months, the US would save an estimated \$13 billion annually on pediatric health care costs attributable to diseases whose risk is decreased by exclusive breastfeeding [6].

The US Health and Human Services' Healthy People 2020 Program has established the following targets [7]: 82% of infants breastfed at birth, 61% at 6 months, and 34% until one year of age. Currently in the US, only 74% of infants are ever breastfed [7]. Breastfeeding is less common among women of lower income, black race, and younger maternal age [8–11]. Internationally, cesarean birth has been shown to be associated with decreased breastfeeding initiation and continuation [12–15].

Multiparous women may also be less likely to initiate breastfeeding [8]. One study of birth certificate data suggested that breastfeeding initiation decreases as birth order increased [16]. Thus, multiparous women might be a target for enhanced breastfeeding education and support.

To investigate maternal characteristics associated with breastfeeding initiation, we used data collected at baseline from mothers enrolled in the Mothers' Outcomes After Delivery (MOAD) study, a longitudinal cohort study of maternal health after childbirth. We hypothesized that rates of breastfeeding initiation would be lower for cesarean versus vaginal births. We further hypothesized that breastfeeding initiation would be consistent across all births for multiparous women. Our broader aims were to identify maternal demographic and obstetrical characteristics associated with breastfeeding and to examine patterns of breastfeeding initiation across multiple pregnancies in multiparous women.

Patients and Methods

Study Population

The current analysis draws upon data collected at baseline from subjects enrolled in the MOAD study, a prospective cohort study of maternal health, beginning 5–10 years after first delivery, with a focus on comparing cesarean versus vaginal births. The study is coordinated by investigators from the Johns Hopkins University and the Greater Baltimore Medical Center. Participants were women who delivered their first baby at Greater Baltimore Medical Center, a large, private hospital in suburban Maryland, with the 4th largest obstetrical service in the state [17]. Institutional review board permission was obtained at both Greater Baltimore Medical Center and Johns Hopkins University, and all participants provided written informed consent.

Recruitment for this longitudinal cohort study began in 2008 and is ongoing. To be eligible, women must have given birth to their first child (index birth) at Greater Baltimore Medical Center 5–10 years prior to enrollment. Participants were identified from obstetrical hospital discharge records using discharge diagnoses. Hospital charts were reviewed by trained personnel to verify eligibility and to confirm delivery type. Potential participants were also screened for eligibility via telephone interview. Exclusion criteria (applied to the index birth) included: maternal age <15 or >50 years, delivery at <37 weeks gestation, placenta

previa, multiple gestation, known fetal congenital anomaly, stillbirth, prior myomectomy, and abruption. Women who developed these events during subsequent pregnancies were not excluded.

After a review of hospital records, delivery type was classified as either vaginal or cesarean birth. Each delivery was also classified by the woman's age at delivery (organized into 5-year strata) and the number of years from first delivery (in 1/4-year strata). In order to attain a sufficient sample for the primary goals of this study, we planned to enroll at least 600 women whose index birth was cesarean and 400 whose index birth was a vaginal delivery. We approached for enrollment all eligible women in the cesarean group. In the vaginal birth group, women within each stratum were randomly assigned a "rank" and recruitment proceeded according to rank until a sufficient sample was attained in each stratum. This strategy was adopted to insure a 3:2 ratio of cesarean:vaginal birth within each stratum.

Based on this scheme, 4,352 eligible women were approached for recruitment. Of those, we were able to contact 2,090 (48.0%). We excluded 41 women who were found to be ineligible, were currently pregnant, had delivered a child within the past 6 months, reported pelvic surgery within the past 6 months, or who were unable to complete written questionnaires in English. Of the 2,049 who were contacted and eligible, 1,030 (50.3%) declined to participate. At the time of analysis, 858 women were enrolled in MOAD, including 351 whose index birth was a vaginal delivery and 507 whose index birth was a cesarean delivery.

Data Collection

At enrollment, each participant completed a detailed questionnaire. For each reported birth, participants were asked the mode of delivery (cesarean versus vaginal). In addition, women were asked to report labor induction, birth weight, 3rd or 4th degree lacerations, emergency cesarean for fetal distress, forceps and vacuum birth and maternal complications (blood transfusion, postpartum sepsis and hospital readmission).

The primary outcomes for this analysis were breastfeeding initiation and duration. Breastfeeding questions were adopted from the National Immunization Survey [18]. For each delivery reported, the woman was asked whether she breastfed that child. In addition to reporting affirmatively or negatively, women were given an option to indicate unsuccessful initiation of breastfeeding ("I tried to breastfeed this baby but it did not work out"). For each birth, a woman's breastfeeding status was classified as either successful breastfeeding (successful initiator), attempting to breastfeed without success (non-successful initiator), or no attempt to breastfeed (non-initiator).

The following variables were identified a priori as exposures that may modify the distribution of breastfeeding initiation: race, maternal education, maternal age at delivery, delivery type, birth weight, 3rd/4th degree laceration, labor induction, emergency cesarean delivery for fetal distress, use of forceps or vacuum, the need for a maternal blood transfusion post-partum, maternal infection/sepsis post-partum, and maternal hospital readmission for postpartum complications. In our analysis of within-woman differences in breastfeeding initiation across pregnancies, we also considered differences by birth order.

Statistical Analysis

The data for this analysis were taken from the baseline (enrollment) assessment. Maternal demographic characteristics and obstetrical events at the index birth were summarized by breastfeeding initiation status at first delivery. Continuous variables were summarized using median and interquartile range (IQR); categorical variables were summarized using percent and frequency. Differences by breastfeeding status in the distribution of maternal

demographic and clinical characteristics at first delivery were tested using Kruskal–Wallis tests for continuous variables and Fishers' Exact Chi-square tests for categorical variables.

For multiparous women, breastfeeding agreement across births was explored. Because relatively few women gave birth four or more times, analysis was restricted to the index, second, and third births of multiparous women. The strength of agreement between the index birth and the 2nd and 3rd births, respectively, was evaluated using percent agreement and kappa statistics [19].

To identify demographic and obstetrical factors associated with breastfeeding practices, we considered breastfeeding status for each birth for all women. Regression analysis was performed using Generalized Estimating Equations to account for repeated observations (births) in multiparous women [20]. Covariates of interest for these models included maternal age (continuous), maternal race (African American versus non-African-American), maternal educational attainment (less than college degree, college degree, versus graduate degree), birth order (1st versus 2nd versus 3rd or higher), self-report of induced labor, self-report of postpartum complications (including maternal blood transfusion, uterine infection or hospital re-admission), and delivery type. In this analysis, delivery type was defined as non-operative vaginal, operative vaginal (use of forceps and/or vacuum), non-emergency cesarean, or emergency cesarean.

Results

Of the 858 women enrolled in MOAD at the time of analysis, 812 (95%) had complete information regarding breastfeeding initiation at all deliveries. Of the 812 women, 585 (72%) were multiparous at enrollment: 429 reported two births and 156 reported 3 or more births. In all, the 812 women reported a total of 1,574 births. The majority of participants were Caucasian (84%) and only 3 women reported Hispanic ethnicity. Participants were relatively well educated: 350 (43%) had a college degree and 275 (34%) had a graduate degree. Median age was 32 years.

Breastfeeding was initiated at the index birth by 740 (91%) of women (Table 1). Of the 740 women who initiated breastfeeding, 593 (80%) reported breastfeeding successfully. For the index birth, differences by breastfeeding status were seen in race ($P=0.03$), education ($P<0.001$), and delivery type ($P=0.02$). Specifically, unsuccessful initiators and non-initiators were disproportionately of African-American race and had less than a college degree. The occurrence of cesarean delivery was heterogeneous across the three breastfeeding groups ($P=0.02$), with the lowest proportion of cesarean births among women who did not attempt to breastfeed (i.e., non-initiators).

Table 2 provides the distribution of breastfeeding initiation status for multiparous women at their second and third deliveries, both overall and stratified by their breastfeeding status at the index birth. Of the 585 women who had a second delivery, 86% reported the same breastfeeding status for their first and second births; among the women with parity of three or more, agreement between breastfeeding status at index and third birth was 83%. The kappa statistic for these two comparisons were 0.63 (95% CI: 0.57, 0.70) and 0.54 (95% CI: 0.42, 0.67) respectively, suggesting overall agreement in reported breastfeeding practices from birth to birth of multiparous women was moderate to good.

The strongest agreement of breastfeeding practices across all deliveries was in women who reported either successful initiation or no initiation at their index birth. Among the 449 multiparous women who breastfed successfully at their index birth, 425 (95%) reported successful initiation at their second birth and 116/121 (96%) reported success at their third birth. Of the 41 multiparous women who did not attempt breastfeeding in their first

pregnancy, 38 (93%) were non-initiators at the second birth; of the 11 non-initiators at index birth with parity of 3 or more, 8 (73%) were non-initiators at their third birth.

Unsuccessful breastfeeding attempts at index birth were associated with failure to initiate breastfeeding in subsequent pregnancies. Specifically, of the 95 multiparas who tried unsuccessfully to breastfeed at the first birth, more than a quarter elected not to initiate breastfeeding at their second birth; of the 24 with parity of three or more, almost half also chose not to initiate at their third birth. As a result, the rate of non-initiation rose from 7% (41/585) at the index birth, to 12% (73/585) at the second birth, to 15% (23/156) at the third birth. This trend was principally fueled by the decision of a substantial portion of women with a history of unsuccessful initiation to elect not to initiate breastfeeding with subsequent births. However, of the 69 women who were unsuccessful breastfeeding a first child and who attempted to breastfeed in the second pregnancy, 41% (28/69) were successful.

Table 3 provides univariate and multivariate estimates of association between the demographic and obstetrical variables of interest and breastfeeding outcomes across all deliveries. Analysis occurred at the levels of births; therefore, women with multiple births provided multiple observations. In univariate analysis, factors significantly associated with non-initiation included maternal education and birth order. In the multivariate analysis, both of these variables remained significantly associated with non-initiation of breastfeeding. Specifically, mothers with less education than a college degree had twice the odds of not initiating breastfeeding compared to mothers who had a college degree (OR = 1.98, 95% CI: (1.19, 3.31)). With respect to birth order, the adjusted odds of non-initiation with second births was almost twice that observed in index births (OR = 1.83, 95% CI: (1.42, 2.35)); odds of non-initiation at subsequent births was almost three times that observed at the index birth (OR = 2.44, 95% CI: (1.56, 3.82)). Restricting this analysis to multiparous women did not qualitatively alter these findings (results not shown).

Considering the 1,405 births associated with breastfeeding initiation, the factors univariately associated with unsuccessful breastfeeding included African-American race, maternal education, birth order, cesarean birth, induced labor, and post-partum maternal complications. However, in multivariate analysis, increasing birth order was the only characteristic associated with unsuccessful breastfeeding. Specifically, among second births characterized by breastfeeding attempt, the odds of unsuccessful breastfeeding was 63% that reported in index births; for births of order 3 or higher, it was 51% that of index births. Restriction to multiparas did not alter these results (data not shown). Thus, with increasing birth order, women were less likely to initiate breastfeeding but more likely to succeed if they initiate.

Discussion

The study's most important findings relate to the observed pattern of breastfeeding across multiple pregnancies among multiparous women. Prior studies have suggested a decrease in breastfeeding among multiparous women compared to primiparas [8, 16]. Our results suggest that this is primarily because women who are unsuccessful with breastfeeding their first child are less likely to attempt breastfeeding with subsequent deliveries. The overall result is a decrease in the proportion of women breastfeeding across pregnancies. Specifically, the rate of non-initiation among multiparous women rose from 7% at the first birth, to 12% at the second birth, and to 15% at the third birth. The public health implication of this observation is that breastfeeding rates among multiparous women might be improved through targeted support and intervention for pregnant women with a history of unsuccessful breastfeeding.

An important finding from this study is that cesarean birth did not impact breastfeeding initiation or success. Our results differ from studies in Europe, which have suggested an association between cesarean delivery and lower rates of breastfeeding [12–15]. While longer hospitalization associated with cesarean birth could theoretically offer more opportunities for breastfeeding education and support, evidence to support a link between the duration of post-partum hospitalization and breastfeeding success is inconclusive [21, 22]. The question of whether cesarean birth influences breastfeeding is increasingly important, as cesarean birth now accounts for 32% of all deliveries [23]. In that respect, our findings are reassuring.

Similar to other investigators, we found differences in breastfeeding initiation by maternal education. Mothers with a college degree had twice the odds of initiating breastfeeding than less educated mothers. In multivariate analysis, our data did not suggest an association between breastfeeding practices and either maternal race or maternal age. These findings contrast with prior studies of breastfeeding practices in the US, suggesting that breastfeeding is less common among younger mothers, less affluent women, and African-American women [8–11]. This discrepancy may be because our population was relatively well-educated (34% had a graduate degree) and were drawn from a private hospital in a suburban setting. Thus, our population may not be sufficiently diverse with respect to socioeconomic status to adequately exclude an impact of these factors on breastfeeding practices.

Our study is potentially limited by the use of maternal recall for breastfeeding outcomes and obstetrical events. Breastfeeding initiation was self-reported up to 10 years after the event and could be subject to recall bias, especially among women who breastfed for a short duration [24]. The generalizability of our results may be limited by the relatively high educational attainment and older age of our study participants, as well as by the exclusion of certain obstetrical conditions, such as prematurity, fetal anomalies, and multiple gestation. In addition, the study population was limited to women that could be contacted 5 to 10 years after birth, indicating that they had a stable residence. These factors did impact participant selection but do not imply selection bias, or a biased estimate of the association between maternal characteristics and breastfeeding practices.

A strength of this study is the unique opportunity to study breast feeding initiation across a woman's reproductive span and to demonstrate the importance of breastfeeding experiences at the time of the first birth. Additionally, our study design also allowed us to compare breastfeeding initiation rates across obstetrical exposures and events, including vaginal versus cesarean birth. Given the rising cesarean rate in the U.S., the impact of cesarean delivery cannot be overstated. Finally, a strength of this analysis is the relatively large study population size, providing adequate power for investigating relevant exposures.

Given the well-established benefits of breastfeeding and the availability of effective programs to promote initiation [25], such interventions should be targeted at women unlikely to initiate breastfeeding and those unlikely to breastfeed successfully. For example, research has demonstrated the efficacy of lactation consultants and community breastfeeding support groups after hospital discharge [26–28]. Further research is needed to establish whether breastfeeding promotion programs should be specifically tailored to the needs of such women. Our study suggests that women who tried unsuccessfully to breastfeed in their first pregnancy are candidates for such intervention. Health care providers can play an important role by identifying mothers who chose not to or did not successfully breastfeed in their first pregnancy and provide lactation education and support for subsequent pregnancies.

Acknowledgments

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Abbreviations

MOAD Study	Mothers' Outcomes After Delivery Study
NHANES III	Third national health and nutrition examination survey

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Table 1

Demographic and obstetrical characteristics of N = 812 women in the mothers' outcome after delivery (MOAD) study, overall and by breastfeeding status at 1st delivery

Characteristic ^{a, b}	Overall	Breastfeeding status at 1st delivery		P-value for difference ^d
		Initiator		
		Successful N = 593 (73%)	Unsuccessful N = 147 (18%)	
	N = 812			N = 72 (9%)
Primary race	N = 803	N = 585	N = 146	N = 72
Caucasian	84% (677)	86% (503)	79% (116)	82% (59)
African-American	12% (100)	10% (61)	18% (26)	18% (13)
Other	3% (26)	4% (22)	3% (4)	0% (0)
Education at baseline	N = 812	N = 593	N = 147	N = 72
High school/GED	4% (32)	3% (20)	3% (4)	11% (8)
Some college (no degree)	19% (155)	16% (96)	27% (39)	28% (20)
College degree	43% (350)	43% (256)	44% (65)	42% (30)
Graduate degree	34% (275)	37% (222)	27% (39)	19% (14)
Maternal age at 1st delivery, years	32 [29, 36]	32 [29, 37]	31 [28, 35]	31 [27, 35]
Cesarean delivery at 1 st birth	59% (475)	57% (339)	68% (100)	50% (36)
Emergency cesarean (C-sect only)	23% (105)	23% (76)	20% (20)	26% (9)
BW of 1st child, grams	3,430 [3118, 3742]	3,402 [3147, 3728]	3,430 [3147, 3771]	3,402 [3033, 3629]
Obstetrical procedures (index birth)				
Induced labor	50% (327/660)	48% (234/448)	53% (60/113)	58% (34/59)
Repair 3 or 4° laceration ^c	14% (34/238)	15% (27/182)	16% (5/32)	8% (2/24)
Forcep or vacuum use ^c	26% (72/280)	25% (52/210)	28% (11/40)	30% (9/30)
Post-partum complications, 1st delivery	N = 812	N = 593	N = 147	N = 72
Blood transfusion	< 1% (3)	< 1% (1)	1% (2)	0% (0)
Uterine infection	1% (9)	1% (6)	1% (2)	1% (1)
Maternal re-admission (index birth)	4% (33)	4% (22)	5% (7)	6% (4)

BW Birth weight, GED graduate equivalency degree, VB vaginal birth, C-sect cesarean delivery

^aMedian [IQR] for continuous variables; %(n) for categorical variables

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^bMissing data: race, n = 9; ethnicity, n = 7; birth weight, n = 1; laceration, n = 99 (among VBs only); induced labor, n = 152; emergency cesarean, n = 13; forceps, n = 37 (among VBs only); vacuum, n = 48 (among VBs only); transfusion, n = 9; uterine infection, n = 13; readmission, n = 1

^cLimited to women whose index birth was a vaginal delivery (N = 337)

^dUnless otherwise indicated, Fisher Exact Test for categorical variables and Kruskal–Wallis Test for continuous variables

^eBased on Pearson Chi-square test for independence

Table 2

Breastfeeding initiation at second and third births, respectively, by breastfeeding status at the index birth in N = 585 multiparous women from the mothers' outcome after delivery (MOAD) study

	Overall	Breastfeeding status at index birth		
		Successful initiator	Unsuccessful initiator	Non-initiator
Breastfeeding status at 2nd birth ^a	N = 585	N = 449	N = 95	N = 41
Successful initiator	78% (455)	95% (425)	29% (28)	5% (2)
Unsuccessful initiator	10% (57)	3% (15)	43% (41)	2% (1)
Non-initiator	12% (73)	2% (9)	27% (26)	93% (38)
Breastfeeding status at 3rd birth ^b	N = 156	N = 121	N = 24	N = 11
Successful initiator	79% (124)	96% (116)	29% (7)	9% (1)
Unsuccessful initiator	6% (9)	1% (1)	25% (6)	18% (2)
Non-initiator	15% (23)	3% (4)	46% (11)	73% (8)

^aThere are N = 585 women with parity 2. Percents shown are conditional on breastfeeding status at index birth

^bThere are N = 156 women with parity 3. Percents shown are conditional on breastfeeding status at index birth

Table 3

Results of uni- and multi-variate logistic regression models for risk factors associated with: (i) non-initiation of breastfeeding (N = 1,574 births) and (ii) unsuccessful initiation of breastfeeding among initiators (N = 1,405 births) across all births

	<u>Relative odds of non-initiation of breastfeeding</u>		<u>Relative odds of unsuccessful initiation among women who initiated breastfeeding</u>	
	<u>Odds ratio (95% CI)</u>		<u>Odds ratio (95% CI)</u>	
	Univariate	Multivariate ^a	Univariate	Multivariate ^b
Maternal Age, per 5 years	1.09 (0.91, 1.30)	0.89 (0.72, 1.10)	0.78 (0.67, 0.91)	0.91 (0.76, 1.09)
Maternal race, AA versus non-AA	1.45 (0.84, 2.49)	1.56 (0.86, 2.83)	1.78 (1.09, 2.91)	1.61 (0.94, 2.76)
Maternal education				
< College degree	1.97 (1.23, 3.14)	1.98 (1.19, 3.31)	1.54 (1.01, 2.36)	1.29 (0.82, 2.04)
College degree	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Graduate degree	0.62 (0.37, 1.05)	0.66 (0.39, 1.12)	0.69 (0.46, 1.04)	0.65 (0.42, 1.00)
Birth order				
1	1 (ref)	1 (ref)	1 (ref)	1 (ref)
2	1.64 (1.34, 2.00)	1.83 (1.42, 2.35)	0.64 (0.53, 0.78)	0.63 (0.50, 0.79)
3+	1.95 (1.38, 2.77)	2.44 (1.56, 3.82)	0.49 (0.35, 0.68)	0.51 (0.33, 0.78)
Delivery type				
Vaginal, non-operative	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Vaginal, operative ^c	0.78 (0.44, 1.36)	1.18 (0.67, 2.10)	1.37 (0.81, 2.32)	1.14 (0.63, 2.05)
Cesarean, non-emergency	1.02 (0.71, 1.48)	1.01 (0.68, 1.48)	1.44 (1.01, 2.07)	1.33 (0.92, 1.94)
Cesarean, emergency	0.77 (0.43, 1.39)	0.97 (0.54, 1.74)	1.76 (1.09, 2.84)	1.22 (0.72, 2.07)
Induced delivery	1.03 (0.72, 1.48)	NA	1.46 (1.05, 2.04)	NA

AA African-American, 95% CI 95% confidence interval, NA not available

The 1,574 births come from 812 women

The 1,405 births come from 745 women

Post-partum maternal complications in the study included maternal blood transfusion, uterine infection, and/or readmission to hospital

^aDue to missing data, based on analysis of 1,329 births from 705 women

^bDue to missing data, based on analysis of 1,185 births from 643 women

^cOperative vaginal delivery defined as a vaginal delivery with self-reported use of forceps or vacuum