

The Influence of Mode of Delivery on Breastfeeding Initiation in Women with a Prior Cesarean Delivery: A Population-Based Study

Jodi Regan,^{1,2} Amy Thompson,² and Emily DeFranco^{1,3}

Abstract

Objective: This study compared breastfeeding initiation following repeat cesarean delivery, successful vaginal birth after cesarean (VBAC), and unsuccessful trial of labor.

Subjects and Methods: We performed a population-based retrospective cohort study of Ohio births (2006–2007) with a previous cesarean delivery. The primary outcomes were breastfeeding initiation rates among women with a previous cesarean delivery. Breastfeeding initiation rates were compared among three different delivery types: repeat cesarean delivery, successful VBAC, and unsuccessful trial of labor. Sociodemographic factors, medical risk factors, and pregnancy-related risk factors were also compared to assess influence on breastfeeding initiation rates.

Results: Women delivered by successful VBAC were 47% more likely to initiate breastfeeding than women delivered by scheduled repeat cesarean (adjusted relative risk 1.47; 95% confidence interval 1.35, 1.60). Women who ultimately delivered by cesarean section with unsuccessful trial of labor were also more likely to breastfeed than women with a scheduled repeat cesarean section (61% vs. 58.7%, respectively) (adjusted relative risk 1.17; 95% confidence interval 1.04, 1.33).

Conclusions: Patients who undergo a scheduled repeat cesarean delivery are less likely to initiate breastfeeding. Women who attempt and succeed in achieving vaginal birth after a previous cesarean section are more likely to breastfeed than are women who deliver by repeat cesarean section. Also, those women who ultimately deliver by cesarean section after an unsuccessful trial of labor were also more likely to breastfeed than those women with a scheduled repeat cesarean section. This suggests there are influences on patient choice for delivery that also may influence the patient's decision to breastfeed.

Introduction

THE NATIONAL INSTITUTES OF HEALTH Consensus Development Conference Statement from March 2010 on vaginal birth after cesarean (VBAC) section acknowledged that the effects of delivery method on breastfeeding initiation are poorly understood.¹ This critical knowledge gap was identified so that adverse effects of delivery mode on breastfeeding practices could be mitigated. Cesarean delivery has been associated with decreased breastfeeding initiation in multiple studies,^{2–19} while in other studies the association is less clear and may not be a factor.^{20–27} Many factors may influence a

mother's decision to breastfeed. Besides known biological factors such as parity, mode of delivery, body mass index (BMI), smoking, breast or nipple abnormalities, surgery, illness, anxiety, and stress, there are behavioral factors that are equally as important.¹⁸ There may also be infant characteristics that contribute to breastfeeding initiation such as gestational age, weight at birth, intrinsic disease, suckling ability, and temperament.¹⁸ Parental attitudes, motivation, and antenatal intentions also play a role in the commitment each individual may have to complete the "birth experience" with breastfeeding. The aim of this study is to estimate breastfeeding initiation rates in women with a prior cesarean

¹Division of Maternal-Fetal Medicine and ²Department of Obstetrics and Gynecology, University of Cincinnati College of Medicine, Cincinnati, Ohio.

³Center for Prevention of Preterm Birth, Perinatal Institute, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio.

All of the analysis, interpretations, and conclusions that were derived from the data source and included in this article are those of the authors and not the Ohio Department of Health.

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section, by comparison of those following repeat cesarean delivery, VBAC, and unsuccessful trial of labor resulting in repeat cesarean delivery. A secondary aim is to correlate other maternal factors with breastfeeding initiation rates.

Subjects and Methods

We performed a retrospective population-based cohort study of all births in Ohio occurring during the years 2006 and 2007. Primary outcomes were breastfeeding initiation rates among women with a prior cesarean delivery. Breastfeeding initiation was compared among women who underwent repeat cesarean delivery, VBAC, and unsuccessful trial of labor resulting in repeat cesarean section. Secondary outcomes included the influence of sociodemographic factors, medical risk factors, and pregnancy-related risk factors on breastfeeding initiation rates.

The study population included live births to women with a previous cesarean delivery. Births complicated by major congenital malformations, delivery <20 weeks or >42 weeks, or multifetal gestation were excluded from the dataset prior to analysis. Breastfeeding initiation rates were compared between births resulting from the three delivery types in question: repeat cesarean delivery, VBAC, and unsuccessful trial of labor resulting in repeat cesarean delivery. Sociodemographic factors, medical risk factors, and pregnancy-related risk factors were also compared to assess influence on breastfeeding initiation rates.

The database included 308,380 live births. Births occurring at gestational ages <20 weeks and >42 weeks and those with major congenital anomalies were excluded. Then, following exclusion of multifetal births ($n=10,662$), a total of 280,882 live-born singletons made up the final cohort for this study. There were minimal missing data for the exposure and outcome variables of interest: 0.1% missing data regarding delivery method, 1.7% missing for breastfeeding status, and <5% missing for other variables of interest.

Statistical analyses were performed using STATA Release 10 software (StataCorp, College Station, TX). Demographic characteristics of the groups were analyzed using unpaired Student's t tests for continuous variables and χ^2 tests for categorical variables. Multivariable logistic regression estimated the association between breastfeeding initiation and mode of delivery after cesarean section after accounting for influential coexisting risk factors. Univariate techniques were used to identify factors significantly associated with the outcome of interest ($p<0.05$). These potential confounding factors were then included in the logistic regression model. Through backward selection, a final regression model was established by sequentially removing covariates and testing for differences. Covariates with a value of $p>0.05$ were removed from the model. Adjusted relative risk (RR_{adj}) values and 95% confidence intervals (CIs) are reported for each of the primary outcomes.

This study was approved by the Ohio Department of Health and Human Subjects Institutional Review Board, and a de-identified dataset of birth certificate data was provided by the Child Policy Research Center of Cincinnati Children's Hospital Medical Center. This study was exempt from review by the Institutional Review Board at the University of Cincinnati, Cincinnati, OH.

Results

The study cohort included 280,882 non-anomalous singleton live births. Of those, 201,560 (71.8%) were vaginal, 50,912

(18.1%) were primary cesarean section, and 28,090 (10.0%) were repeat cesarean deliveries (Table 1). This analysis included the 31,511 (11.2% of total) births to women who had had a previous cesarean delivery. Of women with a prior cesarean section, 25,897 (82.2%) were delivered by scheduled repeat cesarean section, 4,026 (12.8%) were delivered by successful VBAC, and 1,588 (5.0%) resulted in failed trial of labor with repeat cesarean delivery. There was missing information on mode of delivery for 320 (0.1%) birth records.

Black women were more likely than white women to have a trial of labor after cesarean section (25.4% vs. 16%, $p<0.001$) (Table 2). Women with no prenatal care were less likely to undergo scheduled repeat cesarean delivery (72.1%) than women who received prenatal care (82.8%) ($p<0.001$). Obese women with a BMI of $>30\text{ kg/m}^2$ were more likely to undergo scheduled repeat cesarean section compared with women with $\text{BMI}\leq 30\text{ kg/m}^2$ (86.1% vs. 80.6%, $p<0.001$). Obese women who were given a trial of labor were less likely to have a successful VBAC (65.5%) compared with women having lower BMI values (73.4%) ($p<0.001$). Women who attempted a trial of labor after cesarean section with medical co-morbidities of gestational hypertension, gestational diabetes, and pregestational diabetes were less likely to have a successful VBAC compared with women without those co-morbidities (57.8% vs. 72.1% [$p<0.001$], 64.5% vs. 71.9% [$p=0.005$], and 52.7% vs. 71.7% [$p<0.002$], respectively). Women with chronic hypertension who attempted a trial of labor after cesarean section had a similar rate of successful VBAC compared with those without chronic hypertension (72.2% vs. 71.7%, $p=0.90$). Women with any of these four individual co-morbidities who attempted a trial of labor after cesarean section ($n=585$) were less likely to have a successful VBAC than women with none of these co-morbidities (63.5% vs. 72%, $p<0.001$).

During the study period, 59.8% of women with a prior cesarean section initiated breastfeeding, and 40.2% did not (Table 3). Black women were less likely to initiate breastfeeding (46.6%) than white women (61.7%) ($p<0.001$). Among all women with a previous cesarean delivery, cigarette smokers (RR_{adj} 0.73; 95% CI 0.72, 0.73), Medicaid recipients (RR_{adj} 0.40; 95% CI 0.39, 0.41), women with chronic hypertension (RR_{adj} 0.77; 95% CI 0.72, 0.83), and women with no prenatal care (RR_{adj} 0.74; 95% CI 0.69, 0.80) were less likely

TABLE 1. TOTAL NUMBER OF BIRTHS BY MODE OF DELIVERY

| | n (%) |
|---|----------------|
| Total number of births | 280,882 |
| Vaginal | 201,560 (71.8) |
| Cesarean section | |
| Primary | 50,912 (18.1) |
| Repeat | 28,090 (10.0) |
| Deliveries with prior cesarean section | 31,511 (11.2) |
| Scheduled repeat cesarean section | 25,897 (82.2) |
| VBAC | 4,026 (12.8) |
| Failed TOL with repeat cesarean section | 1,588 (5.0) |

Numbers for each category do not sum to 100% because of some missing values.

TOL, trial of labor; BVAC, vaginal birth after cesarean section.

TABLE 2. DEMOGRAPHIC CHARACTERISTICS OF WOMEN WITH A PRIOR CESAREAN SECTION, BY MODE OF DELIVERY (N=31,511)

| | Scheduled repeat cesarean (n=25,897) | VBAC (n=4,026) | Unsuccessful TOL after repeat cesarean (n=1,588) | p value |
|-------------------------------------|--------------------------------------|----------------|--|---------|
| Parity | 2 (2, 3) | 3 (2, 4) | 2 (2, 3) | <0.001 |
| Maternal age (years) | | | | <0.001 |
| ≤ 18 | 239 (83.9) | 36 (11.9) | 27 (8.9) | |
| 19–34 | 20,316 (82.7) | 3,027 (12.3) | 1,209 (4.9) | |
| ≥ 35 | 5,338 (20.6) | 937 (14.1) | 352 (5.3) | |
| Maternal race | | | | <0.001 |
| White | 20,016 (83.9) | 2,792 (11.7) | 1,030 (4.3) | |
| Black | 3,941 (74.7) | 917 (17.4) | 420 (8.0) | |
| Hispanic | 1,227 (82.0) | 194 (13.0) | 75 (5.0) | |
| Other | 560 (81.0) | 81 (11.7) | 50 (7.2) | |
| Number of prior cesarean deliveries | 1.3 (0.6) | 1.1 (0.4) | 1.2 (0.6) | <0.001 |
| | 1 (1, 2) | 1 (1, 1) | 1 (1, 1) | |
| BMI category | | | | <0.001 |
| < 18 kg/m ² | 116 (71.9) | 46 (19.9) | 19 (8.2) | |
| 18–30 kg/m ² | 15,806 (80.7) | 2,784 (14.2) | 1,007 (5.1) | |
| > 30 kg/m ² | 8,169 (86.1) | 864 (9.1) | 455 (4.8) | |
| Tobacco use | 5,057 (19.7) | 709 (17.9) | 250 (15.9) | <0.001 |
| No prenatal care | 372 (1.6) | 110 (3.2) | 34 (2.5) | <0.001 |
| Chronic hypertension | 719 (2.8) | 78 (1.9) | 30 (1.9) | <0.001 |
| Gestational hypertension | 938 (3.6) | 85 (2.1) | 62 (3.9) | <0.001 |
| Gestational diabetes | 1,910 (7.4) | 196 (4.9) | 108 (6.8) | <0.001 |
| Medicaid | 8,540 (34.7) | 1,358 (35.9) | 581 (39.2) | <0.001 |
| WIC | 9,655 (37.3) | 1,396 (34.7) | 610 (38.4) | 0.001 |

Continuous variables are expressed as mean (SD) values or median (interquartile range). Dichotomous variables were expressed as number (percentage).

BMI, body mass index; TOL, trial of labor; VBAC, vaginal birth after cesarean section; WIC, Special Supplemental Nutrition Program for Women, Infants and Children.

to initiate breastfeeding. Additionally, obese women with BMI > 30 kg/m² were less likely to initiate breastfeeding than those with BMI ≤ 30 kg/m² (54.9% vs. 62.8%, $p < 0.001$).

Compared with women with a scheduled repeat cesarean delivery, women delivered by successful VBAC were 42% more likely to initiate breastfeeding, even after accounting for important confounding variables (RR_{adj} 1.42; 95% CI 1.30, 1.56) (Table 4). Despite ultimately delivering by cesarean section, women who attempted a trial of labor and had an unsuccessful VBAC were still more likely to breastfeed than women with a scheduled repeat cesarean (61.3% vs. 58.9%, respectively; RR_{adj} 1.15; 95% CI 1.01, 1.31).

To assess the influence of breastfeeding on mode of delivery after cesarean section in a subset of low-risk women, we created a variable that included low-risk women as defined as BMI < 30 kg/m², no gestational or pregestational diabetes, and no chronic or gestational hypertension. During the study period, 183,618 women (62.9% of the population) were categorized as low risk by this definition. Of low-risk women, 64.4% of women initiated breastfeeding versus 59.5% of those not classified as low risk ($p < 0.001$). Of the low-risk population, 80.4% had a scheduled repeat cesarean section, 14.4% had successful VBAC, and 5.2% had a failed VBAC after trial of labor after cesarean section compared with 85.0%, 10.1%, and 4.9%, respectively, of non-low-risk women ($p < 0.001$). Of the subpopulation of low-risk women, the influence of mode of delivery on breastfeeding initiation was similar to that of the entire study cohort. In low-risk women, those with failed VBAC attempt were more likely to initiate breastfeeding than those with scheduled repeat cesarean section (crude odds

ratio 1.07; 95% CI 0.93–1.24), and those with successful VBAC were the most likely to initiate breastfeeding (crude odds ratio 1.37; 95% CI 1.24–1.51). These findings persisted even after adjustment for the same covariates included in Table 4: with failed VBAC RR_{adj} breastfeeding 1.12 (95% CI 0.95–1.33) and with successful VBAC RR_{adj} 1.41 (95% CI 1.26–1.58).

Discussion

These data indicate that patients who elect a scheduled repeat cesarean delivery are less likely to initiate breastfeeding compared with those who choose a trial of labor after cesarean section. Uniquely, we find that even those individuals who choose a trial of labor after cesarean section and fail their VBAC attempt, and ultimately undergo repeat cesarean section, are more likely to initiate breastfeeding than those with a scheduled repeat cesarean section. These differences remain significant even after adjustment for other socio-demographic and medical factors that influence breastfeeding initiation. One may hypothesize that the women's commitment to breastfeeding was associated with breastfeeding success irrespective of birth type. This may indicate that there is some peculiar mitigating factor unique to a cesarean birth that may negate the experience of breastfeeding and that parental attitude may play a larger role than previously noted.¹²

Our study concurs with findings reported in other studies that certain demographic characteristics are associated with decreased breastfeeding initiation rates in patients who had a cesarean: younger maternal age, increased BMI, lower parity, tobacco usage, and number of prior cesarean sections.^{2–19,28,29}

TABLE 3. DEMOGRAPHIC CHARACTERISTICS OF WOMEN WITH A PRIOR CESAREAN SECTION, BY BREASTFEEDING INITIATION (N=31,511)

| | Breastfeeding (n=18,507) ^a | No breastfeeding (n=12,455) ^a | p value |
|-------------------------------------|--|---|---------|
| Parity | 2 (2, 3) | 1 (0, 1) | <0.001 |
| Maternal age (years) | | | <0.001 |
| ≤18 | 84 (0.4) | 196 (1.6) | |
| 19–34 | 13,833 (74.7) | 10,224 (82.1) | |
| ≥35 | 4,588 (24.8) | 2,033 (16.3) | |
| Maternal race | | | <0.001 |
| White | 14,629 (79.3) | 9,088 (73.7) | |
| Black | 2,327 (12.6) | 2,664 (21.6) | |
| Hispanic | 963 (5.2) | 445 (3.6) | |
| Other | 525 (2.9) | 129 (1.0) | |
| Number of prior cesarean deliveries | 1.29 (0.60) | 1.33 (0.64) | <0.001 |
| BMI category | | | <0.001 |
| <18 kg/m ² | 105 (0.6) | 116 (1.0) | |
| 18–30 kg/m ² | 12,187(69.9) | 7,157 (62.2) | |
| >30 kg/m ² | 5,147 (29.5) | 4,226 (36.7) | |
| Tobacco use | 2,170 (11.8) | 3,734 (30.3) | <0.001 |
| No prenatal care | 193 (1.2) | 300 (2.7) | <0.001 |
| Chronic hypertension | 431 (2.3) | 408 (3.3) | <0.001 |
| Gestational hypertension | 641 (3.5) | 454 (3.6) | 0.34 |
| Gestational diabetes | 1403 (7.6) | 831 (6.7) | 0.019 |
| Medicaid | 4,220 (23.9) | 6,006 (50.6) | <0.001 |
| WIC | 5,129 (27.7) | 6,325 (50.8) | <0.001 |

Continuous variables are expressed as mean (SD) values or median (interquartile range). Dichotomous variables were expressed as number (percentage).

^aOf the total, 549 (1.7%) birth records had missing data on breastfeeding initiation.

BMI, body mass index; WIC, Special Supplemental Nutrition Program for Women, Infants and Children.

We found that those receiving Medicaid, having had no prenatal care, and with chronic hypertension were also less likely in initiate breastfeeding. Mothers without prenatal care may not have the support through education, provider encouragement, and family commitment to increase their likelihood

of success at initiation.^{25,26,30} Therefore, the antenatal intent may not have been present for them to be successful in breastfeeding. Differences in breastfeeding initiation in women with medical complications, low socioeconomic status, and those with less experience (lower parity and younger age) may reflect inherent differences, educational or other, among those populations rather than reflect differences in the desire to initiated breastfeeding.¹⁷

The large sample size and population-based nature is a significant strength of this study, and thus we believe it could be generalized to most populations within the United States. We consider this study to have internal validity as the rates of breastfeeding initiation in the population who had a scheduled cesarean section in our cohort are similar to those reported in published literature.¹² The rates of scheduled repeat cesarean section, VBAC, and unsuccessful VBAC were comparable to the rates overall reported with U.S. national averages.¹ There was also correlation of breastfeeding rates with that of the U.S. literature.^{12,31,32} Uniquely, we found that individuals with failed VBAC were more likely to initiate breastfeeding than those with a scheduled repeat cesarean delivery. It is difficult to say why this particular demographic did better with initiation, but one may infer that this subset of the population is possibly more educated about their experience regarding mode of delivery and more confident and committed to the act of breastfeeding through the entire birth experience.

Limitations of our study include those inherent to studies derived from vital statistics data.^{33–39} Misclassification and underreporting of certain outcomes such as pre-eclampsia, diabetes, or other co-morbidities could bias results toward the null or overestimate effect estimates, dependent on whether they are random or systematic in nature. For this study, we chose exposure (mode of delivery) and outcome (breastfeeding) variables with minimal missing data and with frequencies equivalent to that in the published literature. Therefore, we feel our results are valid, despite the knowledge that not all biases can be thoroughly assessed. The large sample size of this cohort allows for relatively precise point estimates of effect; therefore variations such as underreporting of medical

TABLE 4. LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH BREASTFEEDING INITIATION IN WOMEN WITH A PRIOR CESAREAN SECTION, STRATIFIED BY MODE OF DELIVERY

| | Scheduled repeat cesarean section (n=25,897) | VBAC (n=4,026) | Unsuccessful TOL after repeat cesarean section (n=1,588) |
|----------------------------------|--|----------------------------|--|
| Breastfeeding initiation [n (%)] | 14,428 (58.9) | 2,475 (66.6) | 919 (61.3) |
| | OR (95% CI) reference group | RR _{adj} (95% CI) | RR _{adj} (95% CI) |
| Breastfeeding | 1.0 | 1.42 (1.30, 1.56) | 1.15 (1.01, 1.31) |
| Covariates | | | |
| Maternal age category | — | 1.19 (1.08, 1.30) | 1.12 (0.97, 1.29) |
| Gestational hypertension | — | 0.65 (0.50, 0.85) | 1.01 (0.73, 1.40) |
| No prenatal care | — | 1.94 (1.49, 2.54) | 1.71 (1.14, 2.57) |
| BMI category | — | 0.62 (0.57, 0.68) | 0.85 (0.75, 0.96) |
| Maternal race | — | 1.11 (1.05, 1.18) | 1.26 (1.16, 1.36) |
| Medicaid | — | 1.12 (1.02, 1.23) | 1.30 (1.13, 1.49) |

BMI, body mass index; CI, confidence interval; OR, odds ratio; RR_{adj}, adjusted relative risk; TOL, trial of labor; VBAC, vaginal birth after cesarean section.

complications and other associated factors would likely have only a small effect on our findings. Our study reports only the frequency of breastfeeding initiation at the time of birth certificate generation, within 1–2 days of birth. Because of the nature of the data source, we are unable to ascertain information about breastfeeding intent and how mode of delivery after cesarean section affected the success of breastfeeding initiation in women who intended to breastfeed prior to delivery.

Conclusions

Birth type matters in breastfeeding.⁴⁰ Accounting for this difference in women electing to have a scheduled cesarean section can allow them to be more adequately informed regarding the benefits of lactation. Breastfeeding has been shown to have many maternal and infant health benefits, including lower risk of childhood obesity, diabetes, asthma, and some cancers. Women who breastfeed may experience increased weight loss in the postpartum period as well as decreased incidence of female cancers.¹⁴ In this study we found that individuals who chose to undergo scheduled repeat cesarean delivery are less likely to initiate breastfeeding compared with those who underwent a trial of labor, regardless of ultimate mode of delivery. Uniquely, we found that the frequency of breastfeeding initiation by women who had a failed VBAC was higher than among those who declined a trial of labor after cesarean section. There may be inherent differences or mitigating factors peculiar to the cesarean experience that influence the likelihood of breastfeeding initiation.¹² But, we found that women, even despite ultimately delivering by cesarean section, who chose a trial of labor and had a failed VBAC attempt were more likely to breastfeed than those who declined a trial of labor. This suggests that women with a planned trial of labor are more likely to have the intent to breastfeed. Prospective studies are needed to gather information during the antepartum course to more accurately assess the influence that planned delivery mode has on the intent to breastfeed and whether the intent to breastfeed factors into a women's choice of delivery mode following a cesarean section.

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Disclosure Statement

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Address correspondence to:

Jodi Regan, MD
 Department of Obstetrics and Gynecology
 University of Cincinnati College of Medicine
 Medical Sciences Building, Room 4560
 231 Albert Sabin Way
 Cincinnati, OH 45267-0526

E-mail: reganji@ucmail.uc.edu