Breastfeeding Concerns at 3 and 7 Days Postpartum and Feeding Status at 2 Months

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KEY WORDS breastfeeding, infant, lactation, concerns, problems

ABBRVIATIONS
ARR—adjusted relative risk  
CI—confidence interval  
OR—odds ratio  
PAR—population attributable risk  
UCDMC—University of California Davis Medical Center

Ms Wagner contributed to the secondary analysis study design, analysis and interpretation of the data, and drafting and revision of the article; Dr Chantry contributed to the acquisition of data, analysis and interpretation of data, and critical revisions to the article; Dr Dewey contributed to the study conception and design and critical revisions to the article; Dr Nommsen-Rivers contributed to the study conception and design, acquisition of data, analysis and interpretation of data, and drafting and critical revisions to the article; and all authors approved the final manuscript as submitted.

WHAT’S KNOWN ON THIS SUBJECT: Although most US mothers initiate breastfeeding, half fail to achieve their breastfeeding intentions. In cross-sectional and retrospective surveys, early breastfeeding difficulties are often cited as reasons for stopping breastfeeding earlier than intended.

WHAT THIS STUDY ADDS: We characterized 4179 breastfeeding concerns/problems as reported by primiparas interviewed prospectively. Concerns were highly prevalent and associated with up to ninefold greater risk of stopping breastfeeding earlier than intended. Concerns at 3 to 7 days posed the greatest risk.

abstract

OBJECTIVE: We characterized breastfeeding concerns from open-text maternal responses and determined their association with stopping breastfeeding by 60 days (stopping breastfeeding) and feeding any formula between 30 and 60 days (formula use).

METHODS: We assessed breastfeeding support, intentions, and concerns in 532 expectant primiparas and conducted follow-up interviews at 0, 3, 7, 14, 30, and 60 days postpartum. We calculated adjusted relative risk (ARR) and adjusted population attributable risk (PAR) for feeding outcomes by concern category and day, adjusted for feeding intentions and education.

RESULTS: In 2946 interviews, 4179 breastfeeding concerns were reported, comprising 49 subcategories and 9 main categories. Ninety-two percent of participants reported ≥1 concern at day 3, with the most predominant being difficulty with infant feeding at breast (52%), breastfeeding pain (44%), and milk quantity (40%). Concerns at any postpartum interview were significantly associated with increased risk of stopping breastfeeding and formula use, with peak ARR at day 3 (eg, stopping breastfeeding ARR [95% confidence interval] = 9.2 [3.0–infinity]). The concerns yielding the largest adjusted PAR for stopping breastfeeding were day 7 “infant feeding difficulty” (adjusted PAR = 32%) and day 14 “milk quantity” (adjusted PAR = 23%).

CONCLUSIONS: Breastfeeding concerns are highly prevalent and associated with stopping breastfeeding. Priority should be given to developing strategies for lowering the overall occurrence of breastfeeding concerns and resolving, in particular, infant feeding and milk quantity concerns occurring within the first 14 days postpartum. Pediatrics 2013;132:e865–e875
Although 75% of mothers in the United States initiate breastfeeding, only 13% are exclusively breastfeeding for the recommended duration of 6 months.\textsuperscript{1} Undoubtedly, prenatal breastfeeding intention is an important determinant of breastfeeding practices;\textsuperscript{2} yet, one-half of US mothers fail to achieve their breastfeeding intention, supplementing with infant formula or stopping breastfeeding altogether earlier than planned.\textsuperscript{3,4} New mothers commonly describe the first few weeks of breastfeeding as surprisingly difficult, with many unexpected problems arising.\textsuperscript{5,6} In cross-sectional and retrospective studies, these early breastfeeding challenges are often cited as reasons for early formula use and termination of breastfeeding.\textsuperscript{7,8} However, mothers’ retrospective reports may be biased by their current feeding status. To develop targeted strategies for supporting US mothers in achieving their breastfeeding goals, we need to prospectively identify the specific types and timing of breastfeeding problems that are most likely to lead to formula use.

We characterized the breastfeeding concerns and problems of a large and diverse cohort of first-time mothers as prospectively reported prenatally and at 0, 3, 7, 14, 30, and 60 days postpartum. We then determined the adjusted relative risks (ARRs) of (1) using formula or (2) having stopped breastfeeding by 60 days postpartum, according to the type and timing of breastfeeding concerns reported at earlier interviews, after accounting for prenatal breastfeeding intention.

METHODS

Study Design

To achieve our objectives, we analyzed data from the Early Lactation Success study. Study design, screening, and enrollment are described elsewhere\textsuperscript{9,10} and summarized in Fig 1. Briefly, in this prospective cohort study based at the University of California Davis Medical Center (UCDMC), expectant first-time mothers were initially enrolled and interviewed between 32 and 40 weeks’ gestation. Follow-up continued with 6 postpartum interviews through the first 2 months or until the mother reported that she was no longer breastfeeding or feeding her expressed breast milk. The UCDMC, while not “baby friendly” certified, has a breastfeeding policy consistent with the Ten Steps for Successful Breastfeeding.\textsuperscript{11} During the study period, International Board Certified Lactation Consultants were generally available on the maternity unit 6 days per week and after discharge at the UCDMC Breastfeeding Clinic. The study research assistants referred participants to UCDMC breastfeeding support resources as needed.

This study and subsequent analyses were approved by the University of California Davis Institutional Review Board, with additional approval for continued data analysis from the Cincinnati Children’s Hospital Institutional Review Board.

Data Collection

Prenatal

A trained research assistant conducted the prenatal interview in-person and in the participant’s preferred language (English or Spanish). During the prenatal interview, we collected sociodemographic data (including self-identified ethnicity, years of education completed, and health-insurance status, used as a proxy for income). We also interviewed participants about infant feeding attitudes and intentions (refer to online supplement for specific questions asked), including length of planned breastfeeding duration, age when planning to introduce infant formula or other milks, breastfeeding self-efficacy,\textsuperscript{12} infant feeding practices of family and friends, and strength of intentions to provide breast milk as the sole milk source for 6 months. For the latter, we used the validated Infant Feeding Intentions Scale,\textsuperscript{13} with possible scores ranging from 0 (not planning to breastfeed at all) to 16 (very much agree that I will be breastfeeding my infant without using any formula or other milk for at least the first 6 months). We assessed maternally reported breastfeeding concerns by asking the open-ended interview question, “What concerns, if any, do you have about being able to breastfeed?” Further details about the prenatal interview have been described previously.\textsuperscript{9}

Postnatal

The Follow-up Team operated without knowledge of the mothers’ responses to the prenatal interview, to prevent bias in data collection regarding feeding concerns and practices. We determined infant feeding status at each follow-up interview time point (see Fig 1 for definitions). We assessed maternally reported breastfeeding problems/concerns (hereafter referred to as breastfeeding concerns) in participants who had attempted to breastfeed or feed their infant expressed breast milk since the previous interview. We asked at each follow-up interview to “Please describe any problems or concerns you have had since our last interview or are currently having about feeding your infant, including breastfeeding problems, concerns, or discomforts.” Participants could list as many concerns as they wished. Interviewers specifically inquired about concerns that were mentioned, but not resolved, at the previous interview.

We assessed participants’ reported support for and attitudes toward breastfeeding through an ad hoc composite score of 3 Likert-type questions about recognized barriers to breastfeeding\textsuperscript{14} asked at day 3: (1) “How much support for breastfeeding...
do you receive from close family and friends?" (2) "Compared to bottle feeding, how convenient do you think breastfeed-
ing is?" (3) "Do you feel embarrassed to breastfeed or think you might find breastfeeding embarrassing?" Each question was scored 0, 1, or 2 for a maximum of 6.

Collection of labor and delivery information, measurement of maternal BMI at day 7, and medical record data extraction are described elsewhere.10,15

Qualitative Data Analysis
The primary coder (Ms Wagner) reviewed all the breastfeeding concern responses from all interview time points to assess the scope of the responses provided. She then sorted responses by salient words and concepts by using a "cut and paste" approach to develop a preliminary coding framework.16 Two secondary coders (Drs Nommsen-Rivers and Chantry) reviewed the coding framework, and all 3 discussed cases where there was disagreement and achieved a final coding framework by consensus, consolidating related codes to create subcategories and main categories of breastfeeding concerns. The primary coder applied the final coding framework to all responses from all 7 interview time points. Multiple codes could be assigned to each response. At regular intervals throughout the coding process, the secondary coders reviewed the assignment of codes and resolved discrepancies through discussion.

Quantitative Data Analysis
Maternal Characteristics
We categorized all covariates as described previously.10 In particular, we categorized education level as high school diploma or less versus some college or more and categorized the Infant Feeding Intentions Scale score

FIGURE 1
Flow diagram of participant screening, enrollment, and follow-up in the Early Lactation Success study.

993 women receiving prenatal care at UCDMC between January 2006 and December 2007 systematically screened during last trimester of pregnancy

768 met prenatal eligibility criteria
Inclusion: expectant primipara; anticipating term delivery of a single, healthy infant, English or Spanish-speaking; living within an 8-mile radius of UCDMC
Exclusion: referred to UCDMC for high-risk medical condition; known absolute contraindication to breastfeeding; <16 years of age or <19 years of age and unable to obtain parental consent

532 enrolled and interviewed prenatally
Assessed breastfeeding intentions, self-efficacy, concerns, and attitudes

447 eligible for postpartum follow-up
Women were interviewed in-person within 24 hours of delivery (day 0), at 72–96 hours (day 3), and 1 week postpartum (day 7); and by telephone at 2 weeks, 1 month, and 2 months postpartum (day 14, day 30, and day 60). At each interview, we assessed feeding mode and maternal report of breastfeeding concerns and problems

418 with infant feeding status at 2 months, including:
354 with prenatal intent to provide breast milk as the sole source of milk for >2 months
406 with prenatal intent to breastfeed >2 months

236 (31%) declined: too busy (121), not interested (59), study too intrusive (43), did not want to be interviewed about breastfeeding (8), other (5)

40 (8%) lost to follow-up before delivery
45 (9%) became ineligible at delivery: Preterm birth (11), mother and/or infant admitted to the special care unit for >24 hours (21), chose not to breastfeed (13)

29 (6%) lost to postpartum follow-up

166 (47%) fed any formula between 30 and 60 days postpartum
86 (21%) stopped breastfeeding by 60 days postpartum
as weak (0–7.5), moderate (8–11.5), strong (12–15.5), or very strong (a maximum score of 16). We categorized the breastfeeding support composite score (reported support for and attitudes toward breastfeeding) at day 3 as least (0–4), moderate (5), and most (6).

**Prevalence of Breastfeeding Concerns**

All participants who responded to the breastfeeding concern question were coded for the absence or presence of each breastfeeding concern subcategory and main category at each interview time point.

**Modeling Risk of Adverse Outcomes**

We modeled the risk of the following 2 adverse outcomes: stopped breastfeeding by 60 days (defined as no breastfeeds or expressed breast milk feeds in the 24 hours preceding day 60) and fed any formula between 30 and 60 days postpartum (defined as supplementing breastfeeding with formula or feeding only formula between day 30 and day 60; ie, lack of “full breastfeeding”17). For the outcome “stopped breastfeeding by 60 days,” we restricted the analysis to participants with prenatal intent to breastfeed for at least 2 months and for “fed any formula between 30 and 60 days” we restricted the analysis to participants with prenatal intent to provide breast milk as the sole milk source for at least 2 months.

To identify potentially confounding variables, we performed $\chi^2$ analysis to evaluate the associations of maternal characteristics with breastfeeding concerns and with our 2 adverse outcomes. We then used logistic regression analysis to estimate the odds ratio (OR) and 95% confidence interval (CI) for these 2 outcomes by main categories of breastfeeding concerns in both unadjusted and adjusted models. Since the OR overestimates relative risk when outcomes are common,18 for select models we also calculated the ARR and 95% CI by using the method described by Kleinman and Norton.19

Finally, to determine the overall impact of the more common breastfeeding concerns on stopping breastfeeding, we calculated population attributable risks (PARs). In this study PAR represents the excess proportion of those who stopped breastfeeding that could theoretically be eliminated by prevention of a particular breastfeeding concern at a specific time point. We adapted a formula from Szklo and Nieto,18 substituting ARR for RR, to calculate adjusted PAR [prevalence of breastfeeding concern × (ARR – 1)] ÷ [prevalence of breastfeeding concern × (ARR – 1)] + 1] × 100.

All analyses were performed by using SAS 9.3 (SAS Institute, Inc, Cary, NC).

**RESULTS**

**Cohort Characteristics and Categories of Breastfeeding Concerns**

Figure 1 summarizes sample size across study time points, and Table 1 presents cohort characteristics. None of the characteristics presented in Table 1 differed significantly between the prenatal and follow-up cohorts.

In total, participants reported 4179 breastfeeding concerns over 2946 interviews. In our qualitative analysis, we identified 49 distinct breastfeeding concerns, which we consolidated into 9 main thematic categories. These main categories and their subcategories are described in Table 2.

Figure 2 displays the prevalence of breastfeeding concerns over time. All main categories, but not all subcategories, were represented at every interview time point. At the prenatal interview, 79% of mothers reported at least 1 infant feeding concern. Postnatally, the prevalence of any breastfeeding concern peaked at day 3 (92%) and declined gradually thereafter, but the majority of participants continued to report breastfeeding concerns throughout the study. “Infant feeding difficulty” was the most prevalent concern reported at day 0 (44%) and day 3 (54%). “Pain while breastfeeding” peaked at day 7 (47%) and was the most prevalent concern at that and subsequent interviews. Concern about “milk quantity” peaked at day 3 (41%). Prevalence of maternal report of “uncertainty with own breastfeeding ability” was highest at the prenatal interview (28%).

Supplemental Table 4 details the prevalence of the most common breastfeeding concerns at the prenatal, day 3, and day 7 interviews, stratified by maternal characteristics.

**Risk of Adverse Outcomes**

Of women who planned prenatally to provide breast milk as the sole source of milk for >2 months, 47% (166/354) fed any formula between 30 and 60 days postpartum.
<table>
<thead>
<tr>
<th>Main Category</th>
<th>Subcategories</th>
</tr>
</thead>
</table>
| 1. Infant feeding difficulty | Problems with latch  
Infant sleepy or going too long between breastfeeds  
Infant refuses to breastfeed/nipple confusion  
Infant fussy or frustrated at the breast  
Problems with the frequency or length of infant’s breastfeeds  
Infant not feeding well  
Other difficulty feeding at the breast |
| Encompasses reported difficulties with how the infant is feeding at the breast |                                                                                   |
| 2. Milk quantity       | Inadequate maternal production or milk supply  
Infant not getting enough milk or unsure if getting enough milk  
Infant shows signs of hunger  
Milk not in |
| Includes concerns that the mother is not producing or the infant is not getting sufficient breast milk |                                                                                   |
| 3. Uncertainty with own breastfeeding ability | Breastfeeding technique, positioning, or getting used to breastfeeding  
Not sure how long breastfeeding duration or frequency should be  
Breast anatomy adequacy  
Milk quality or nutritional adequacy of exclusive breast milk diet  
Breastfeeding too difficult or time-consuming  
Wanting someone else to feed the infant  
Tired or exhausted  
Uncomfortable with the act or connotations of breastfeeding  
Not meeting breastfeeding goals  
Other uncertainty with breastfeeding ability |
| Responses in which the mother questions her own breastfeeding skills or perseverance |                                                                                   |
| 4. Pain while breastfeeding | Painful nipples  
General or unspecified breastfeeding pain  
Sore breasts, engorgement, or breast pain  
Cesarean delivery or other pain not related to breasts or nipples  
Mastitis  
Thrush or yeast infection  
Biting |
| Includes nipple pain or any other pain associated with breastfeeding |                                                                                   |
| 5. Signs of inadequate intake | Weight loss  
Jaundice  
Urine and stool output or signs of dehydration  
Hypoglycemia |
| Includes references to medical signs in the infant of inadequate milk intake |                                                                                   |
| 6. Mother/infant separation | Work or school  
Other separation |
| 7. Maternal health/medication | Medications affecting infant through breast milk  
Medication and effect on milk supply |
| References to medications or health conditions (whether true contraindications or not) interfering with breastfeeding | Maternal health problem related to breastfeeding |
| 8. Too much milk | General too much milk  
Strong let-down  
Leaking |
| Includes references to strong milk ejection reflex or leaking |                                                                                   |
| 9. Other | Formula-feeding  
Digestive issues, spitting up  
Burping  
Infant medical concern (other than sign of inadequate intake)  
Pacifier  
Pumping or expressing breast milk  
Breastfeeding aids or alternate feeding methods  
Overfeeding  
Other infant behavior (non-specific to feeding) |
| Refers to feeding problems or concerns not directly related to feeding at the breast |                                                                                   |

*Overall, 4179 distinct feeding problems or concerns were reported over 2946 combined interviews (prenatal and days 0, 1, 7, 14, 30, and 60 postpartum). At each interview, women were asked to describe any problems or concerns they had (currently or since the previous interview) about feeding their infant; postpartum interviews were only conducted with women who had breastfed or expressed their breast milk since the previous interview.*
days. Of women who planned pre-
natally to breastfeed > 2 months, 21% (88/406) stopped breastfeeding by 60
days (Fig 1). Table 3 presents the OR and adjusted OR for these outcomes by
breastfeeding concern at each inter-
view time point. In our final adjusted
models, we included prenatal Infant
Feeding Intention category and educa-
tion level as covariates. Addition of
maternal age, ethnicity, health ins-
urance status, and prenatal breast-
feeding self-efficacy did not cause
significant change in models already
adjusted for prenatal Infant Feeding
Intention category and maternal edu-
cation.
Overall, the ARR of having fed any for-
ma between 30 and 60 days andstopped breastfeeding by 60 days were
significantly greater among those with
any (versus no) breastfeeding concern
at each of the postnatal (but not pre-
natal) interview time points in adjusted
models. The relative risk was highest at
day 3: ARR (95% CI), 3.3 (1.7–15.0) for fed
any formula between 30 and 60 days;
and 9.2 (3.0–infinity) for stopped
breastfeeding by 60 days.
Only 1 of the 34 women who reported no
breastfeeding concerns at day 3 had
stopped breastfeeding by 60 days.
These 34 women presented a rare
characteristic (no reported breast-
feeding concerns at day 3) associated
with a positive outcome (nearly all still
breastfeeding at day 60), a condition
described as “positive deviance.”
We carried out a post hoc analysis of
differences between this group and
women who reported 1 or more
breastfeeding concerns at day 3. The
former were significantly more likely
than the latter to be <30 years of age,
Hispanic, have strong prenatal breast-
feeding self-efficacy, have had an un-
medicated vaginal delivery, and report
strong breastfeeding support (Sup-
plemental Fig 5).
The breastfeeding concern main cate-
gories significantly associated during
at least 1 postpartum interview time
point with increased risk of having fed
any formula between 30 and 60 days
and/or stopping breastfeeding by 60
days in adjusted logistic regression
models were milk quantity concern,
infant feeding difficulty, uncertainty
with breastfeeding ability, and “sign of
insufficient intake” (Fig 3). In un-
adjusted models, pain while breast-
feeding at day 7 was associated with
stopping breastfeeding by 60 days, but
the significance disappeared after
adjusting for feeding intention cate-
gory and education level (Table 3).

FIGURE 2
Prevalence of maternally reported breastfeeding concerns (main categories) by interview time point. At the prenatal interview, women were asked about their
breastfeeding concerns. At each postpartum interview, women who had breastfed or expressed their breast milk since the previous interview were asked to
describe any problems or concerns they had (currently or since the previous interview) about feeding their infant. Main categories in legend are presented top
to bottom in order of prevalence at the day 3 interview. “Maternal health and medication” and “too much milk” main categories are not shown (prevalence ≤
2% at any time point). Prevalence results are not adjusted for confounders.
### Table 3: ORs for Fed Any Formula Between 30 and 60 Days and Stopped Breastfeeding by 60 Days by Breastfeeding Concern Main Category

<table>
<thead>
<tr>
<th>Interview Time Point</th>
<th>Breastfeeding Concern Main Category</th>
<th>Fed Any Formula Between 30 and 60 Days</th>
<th>Stopped Breastfeeding by 60 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequency of Report of Concern, N (%)</td>
<td>OR (95% CI) Adjusted OR (95% CI)</td>
</tr>
<tr>
<td></td>
<td>Any concern</td>
<td>278 (79)</td>
<td>0.8 (0.8–2.2)</td>
</tr>
<tr>
<td></td>
<td>Infant feeding difficulty</td>
<td>125 (35)</td>
<td>0.8 (0.5–1.3)</td>
</tr>
<tr>
<td></td>
<td>Milk quantity concern</td>
<td>114 (32)</td>
<td>0.8 (0.5–1.3)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty with breastfeeding</td>
<td>102 (28)</td>
<td>1.3 (0.9–2.1)</td>
</tr>
<tr>
<td></td>
<td>Day 0 Any concern</td>
<td>272 (77)</td>
<td>1.1 (0.7–1.7)</td>
</tr>
<tr>
<td></td>
<td>Infant feeding difficulty</td>
<td>155 (44)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Milk quantity concern</td>
<td>100 (28)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty with breastfeeding</td>
<td>85 (24)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Day 3 Any concern</td>
<td>324 (92)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Infant feeding difficulty</td>
<td>188 (54)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Milk quantity concern</td>
<td>146 (42)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty with breastfeeding</td>
<td>101 (29)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Day 7 Any concern</td>
<td>285 (83)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Infant feeding difficulty</td>
<td>153 (45)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Milk quantity concern</td>
<td>92 (27)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty with breastfeeding</td>
<td>75 (22)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Day 14 Any concern</td>
<td>244 (73)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Infant feeding difficulty</td>
<td>113 (34)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Milk quantity concern</td>
<td>65 (19)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty with breastfeeding</td>
<td>52 (15)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Day30 Any concern</td>
<td>223 (68)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Infant feeding difficulty</td>
<td>88 (27)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Milk quantity concern</td>
<td>64 (20)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty with breastfeeding</td>
<td>41 (13)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Day30 Any concern</td>
<td>110 (34)</td>
<td>1.0 (0.7–1.5)</td>
</tr>
<tr>
<td></td>
<td>Breastfeeding pain</td>
<td>35 (10)</td>
<td>3.0 (1.4–6.4)</td>
</tr>
<tr>
<td></td>
<td>Sign of insufficient intake</td>
<td>5 (1)</td>
<td>75.0/47.0</td>
</tr>
</tbody>
</table>

a. ORs for Fed Any Formula Between 30 and 60 Days and Stopped Breastfeeding by 60 Days by Breastfeeding Concern Main Category. The table includes ORs for different breastfeeding concerns and time points, with adjusted ORs provided as well. The table also includes the frequency of report of concern, the frequency of feeding any formula, and the frequency of stopped breastfeeding by 60 days.

Note: PN = prenatal interview at 32–40 weeks’ gestation; Day 0, within 24 hours postpartum; Day 3, 72–96 hours postpartum; Day 7, Day 14, and Day 30 at 1 week, 2 weeks, and 1 month postpartum, respectively.

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4. Analysis restricted to mothers who indicated prenatal intent to provide breast milk as the sole source of milk: >2 mo (N = 553, PN and day 0; N = 551, day 3; N = 342, day 7; N = 356, day 14; N = 528, day 30).
5. Analysis restricted to mothers who indicated prenatal intent to breastfeed >2 mo (N = 406, PN and day 0; N = 402, day 5; N = 392, day 7; N = 579, day 14; N = 573, day 30).
6. Referent = mothers who did not report the problem or concern.
7. Adjusted for prenatal infant feeding intentions Scale category and maternal education level. Further adjustment for maternal age, ethnicity, health insurance status, or prenatal breastfeeding self-efficacy did not appreciably change the parameter estimates of the models.
Report of “other” breastfeeding concerns was not significantly associated with either adverse outcome. We did not examine concerns categorized as “mother-infant separation,” “maternal health/medication,” or “too much milk,” in relation to either adverse outcome because their prevalence never exceeded 10%.

Refer to Supplemental Table 5 for examination of the odds of stopping breastfeeding stratified by breastfeeding concern subcategories for the most commonly reported main categories. Most notably, the predominant subcategories at day 7 contributing to stopping breastfeeding under the infant feeding difficulty main category were “fussy or frustrated at the breast,” “infant refusing to breastfeed/nipple confusion,” and “problems with latch.”

**Population Attributable Risk**

The greatest contributors to stopping breastfeeding by 60 days were day 3 or day 7 infant feeding difficulty concerns (adjusted PAR, 28% and 32%, respectively) and day 14 milk quantity concerns (adjusted PAR, 23%; Fig 4).

**DISCUSSION**

Among a diverse cohort of first-time mothers, breastfeeding concerns during the first 2 months postpartum were highly prevalent, persistent, and associated with not meeting breastfeeding goals. Adjustment for maternal education and prenatal breastfeeding intentions only strengthened associations between concerns and adverse outcomes, suggesting that our findings are not explained by weak intentions or demographic factors. Notably, prenatal concerns were not associated with adverse outcomes (ie, these results do not appear to be simply the “self-fulfillment” of anticipated problems). Further, although there were wide differences in the prevalence of prenatal breastfeeding concerns by demographic strata, demographic differences in postnatal breastfeeding concerns largely diminished as challenges in successfully establishing breastfeeding became nearly universal across all strata. The generalizability of our findings may be limited to settings with similar levels of breastfeeding support; the association between breastfeeding concerns and later formula use may be weaker in a baby-friendly hospital but may be stronger in a community where breastfeeding is less normative.

Similar to the findings of Taveras et al, we observed that breastfeeding concerns...
reporting early in the maternity stay (ie, our day 0 interview) were only modestly associated with using formula between 30 and 60 days postpartum or stopping breastfeeding. However, concerns reported later in the first week postpartum were strongly associated with these adverse outcomes. This may be because our day 3 and day 7 interviews captured a time when there is often a gap between hospital and community lactation support resources. Even after excluding those who planned to introduce formula in the first 2 months, 50% of women who reported at least 1 breastfeeding concern at day 3 ended up feeding formula between 30 and 60 days postpartum, compared with only 15% of women who reported no breastfeeding concern. Similarly, 23% of women with at least 1 breastfeeding concern at day 3 had stopped breastfeeding altogether by 60 days, compared with only 3% of women with no breastfeeding concern.

Closer inspection of the 34 women who did not report a breastfeeding concern at day 3, ie, the positive deviants, revealed key characteristics (such as prenatal self-confidence about breastfeeding, youth, unmedicated vaginal birth, and strong breastfeeding support) that seem to serve as protective factors against experiencing breastfeeding concerns that lead to formula use. This is consistent with previous reports indicating that peer counseling and birth doula care are associated with improved breastfeeding outcomes. Although higher prenatal breastfeeding self-efficacy has been associated with better breastfeeding outcomes, in post hoc analysis, higher prenatal breastfeeding self-efficacy did not significantly attenuate the risk of using formula or stopping breastfeeding in relation to the concerns presented in Fig 3 (data not shown).

The concerns we found to be most strongly associated with stopping breastfeeding (infant feeding difficulty and milk quantity concern) are consistent with results of retrospective studies. For example, in the Infant Feeding Practices Study (II), the top fixed-response reasons mothers gave at 2 months postpartum for having stopped breastfeeding were “my infant had trouble sucking or latching on” and “breast milk alone didn’t satisfy my infant.” In a qualitative study of reasons for in-hospital formula supplementation among low-income mothers of infants under 12 months, DaMota et al concluded that new mothers commonly lack understanding about the breastfeeding process; thus, the misinterpretation of appropriate newborn behaviors often leads to maternal requests for infant formula. Breastfeeding concerns articulated by the first-time mothers in our cohort may also have arisen in part from a lack of understanding of normal lactation. In our study, we did not attempt to corroborate mothers’ breastfeeding concerns against clinical indicators. However, regardless of whether maternally reported breastfeeding concerns are congruent with clinical signs, they are strongly associated with breastfeeding outcomes and therefore warrant attention.

Because inquiry into breastfeeding concerns was just 1 question among many we asked at each interview time point, our characterization of some concerns may be underdeveloped as compared with in-depth interviews: maternal concerns may have been broad characterizations or symptoms of an underlying breastfeeding issue, and it is likely that further probing would have provided deeper insight. Also, our participants may have had breastfeeding concerns that they were reluctant to share with the research assistant, reporting what they considered to be socially acceptable responses rather than, for example, concerns about sexuality or body image and breastfeeding. Nonetheless, for a prospective cohort study of its magnitude (2946 interviews), ours is unique in not relying on fixed responses. In contrast to restricting respondents to categories that may not “fit” the true experience, we were able to develop our

FIGURE 4
Adjusted PAR for select breastfeeding concerns based on estimated risk adjusted for prenatal Infant Feeding Intention Scale category and maternal education level. For each time point, total bar height denotes overall incidence of having stopped breastfeeding by 60 days (per 100 study participants with feeding concern for same time point: closed square = infant feeding difficulty; open square = milk quantity concern).
categories from open-text responses and, at the same time, have sufficient statistical power to quantitatively examine the category-specific risks associated with breastfeeding outcomes at key time points while accounting for prenatal breastfeeding intention.

CONCLUSIONS

Breastfeeding problems were a nearly universal experience in this cohort of first-time mothers. Our results indicate that to effectively support new mothers in meeting their breastfeeding goals, future efforts should consider strengthening the protective factors that reduce the prevalence of breastfeeding concerns and appropriately responding to any concerns that do arise, in particular how the infant feeds at the breast in the early postdischarge period and milk supply concerns lingering into the second week postpartum, as they forewarn of failure to meet breastfeeding goals. Overall, our results reinforce the recommendation of the American Academy of Pediatrics that all breastfed newborns receive an evaluation by a provider knowledgeable in lactation management within 2 to 3 days postdischarge.

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