Breastfeeding Education and Support Trial for Overweight and Obese Women: A Randomized Trial

WHAT'S KNOWN ON THIS SUBJECT: Obesity is a risk factor for failure to initiate breastfeeding, formula supplementation, and short breastfeeding duration. There is a need for interventions that can improve the breastfeeding outcomes of overweight and obese women.

WHAT THIS STUDY ADDS: Breastfeeding peer counseling targeting overweight/obese women did not affect exclusive breastfeeding rates or breastfeeding continuation beyond 2 weeks. However, the intervention was associated with improvements in early breastfeeding intensity and fewer infant hospitalizations in the first 6 months after birth.

abstract

OBJECTIVE: To evaluate a specialized breastfeeding peer counseling (SBFPC) intervention promoting exclusive breastfeeding (EBF) among overweight/obese, low-income women.

METHODS: We recruited 206 pregnant, overweight/obese, low-income women and randomly assigned them to receive SBFPC or standard care (controls) at a Baby-Friendly hospital. SBFPC included 3 prenatal visits, daily in-hospital support, and up to 11 postpartum home visits promoting EBF and addressing potential obesity-related breastfeeding barriers. Standard care involved routine access to breastfeeding support from hospital personnel, including staff peer counselors. Data collection included an in-hospital interview, medical record review, and monthly telephone calls through 6 months postpartum to assess infant feeding practices, demographics, and health outcomes. Bivariate and logistic regression analyses were conducted.

RESULTS: The intervention had no impact on EBF or breastfeeding continuation at 1, 3, or 6 months postpartum. In adjusted posthoc analyses, at 2 weeks postpartum the intervention group had significantly greater odds of continuing any breastfeeding (adjusted odds ratio [aOR]: 3.76 [95% confidence interval (CI): 1.07–13.22]), and giving at least 50% of feedings as breast milk (aOR: 4.47 [95% CI: 1.38–14.5]), compared with controls. Infants in the intervention group had significantly lower odds of hospitalization during the first 6 months after birth (aOR: 0.24 [95% CI: 0.07–0.86]).

CONCLUSIONS: In a Baby-Friendly hospital setting, SBFPC targeting overweight/obese women did not impact EBF practices but was associated with increased rates of any breastfeeding and breastfeeding intensity at 2 weeks postpartum and decreased rates of infant hospitalization in the first 6 months after birth. *Pediatrics* 2013;131:e162–e170

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KEY WORDS

breastfeeding, peer counseling, obesity, overweight, exclusive breastfeeding, hospitalization, breastfeeding self efficacy

ABBREVIATIONS

aOR—adjusted odds ratio
BHP—Breastfeeding: Heritage and Pride
CI—confidence interval
EBF—exclusive breastfeeding
PC—peer counselor
SBFPC—specialized breastfeeding peer counseling
WIC—Supplemental Nutrition Program for Women, Infants, and Children

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Recent research has identified poor breastfeeding outcomes among overweight/obese women. Specifically, overweight and obese women are less likely to initiate breastfeeding,^{1–5} continue breastfeeding,^{1–4,6,7} and exclusively breastfeed⁶ than women of normal BMI. The etiology of these breastfeeding difficulties is likely multifactorial.^{7–13} These suboptimal breastfeeding practices are concerning, because children of obese women are at high risk of developing obesity¹⁴ and a growing body of evidence indicates that breastfeeding is protective against childhood obesity.^{15–18}

Given the high rates of overweight and obesity among US low-income women,¹⁹ combined with their poor breastfeeding practices,²⁰ it is essential to evaluate interventions promoting breastfeeding to overweight/obese, low-income women. The Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides low-income women with breastfeeding education and support. Consistent with the growing evidence that peer counselors (PCs; ie, women from the target community who have been specially trained to provide breastfeeding education and support) effectively improve breastfeeding outcomes,²¹ WIC has expanded its PC services. However, WIC does not provide PC resources/protocols needed for intensive, targeted support for overweight/obese women.

The only published report of breastfeeding interventions targeting obese women revealed that 2 low-intensity interventions had no effect on breastfeeding outcomes.²² We have previously demonstrated that PC significantly improves breastfeeding initiation and exclusivity among low-income women,^{23,24} but we are not aware of a single PC trial targeting overweight and obese women. Therefore, the objective of this randomized trial was to evaluate a specialized breastfeeding peer counseling (SBFPC) intervention promoting

exclusive breastfeeding (EBF) among overweight/obese, low-income women. We hypothesized that the intervention group would have higher rates of breastfeeding initiation, duration, and exclusivity, compared with controls. Secondary aims were to evaluate the effect of the intervention on breastfeeding self-efficacy, infant health and health care utilization, and maternal amenorrhea.

METHODS

Participants ($N = 206$) were recruited at Hartford Hospital's prenatal clinic between May 2006 and July 2009 by a bilingual, bicultural research assistant. Inclusion criteria specified participants must be considering breastfeeding and have a prepregnancy BMI ≥ 27.0 , based on documented breastfeeding difficulties above this cutoff.²⁵ BMI was calculated by using medical record data (recalled prepregnancy weight and height collected at the first prenatal visit). Additional inclusion criteria were as follows: ≥ 18 years, ≤ 36 weeks' gestation, singleton pregnancy, absence of medical conditions interfering with breastfeeding, planning to remain in the area for 6 months postpartum, income $< 185\%$ of the federal poverty level, and having telephone access. All participants provided written informed consent. Each week, the study coordinator used SPSS software (SPSS Inc, Chicago, IL) to randomly assign 50% of newly recruited participants to the intervention group, thus preserving allocation concealment. Women in both groups were cared for by the same obstetric practice. At delivery, infant inclusion criteria were as follows: ≥ 36 weeks' gestation, birth weight ≥ 2.5 kg and ≤ 3.9 kg, 1 and 5 minutes Apgar scores of ≥ 6 , and no NICU admission. This randomized trial was a collaboration between the University of Connecticut, Hartford Hospital, and the

Hispanic Health Council and was approved by each institutional review board. Hartford Hospital has been a Baby-Friendly hospital since December 2000, and its prenatal clinic serves a low-income, predominantly Latina population.

Control Procedures

Controls received standard care at Hartford Hospital. Prenatal breastfeeding education included brief breastfeeding discussions during routine clinic appointments and receipt of written educational materials. Staff nurses provided routine perinatal breastfeeding assistance, with lactation consultants available as needed. After discharge, participants could call the hospital's "warm line" with breastfeeding questions.

Standard care also included optional breastfeeding support from Breastfeeding: Heritage and Pride (BHP) PCs, who provided the following: up to 3 prenatal visits (covering breastfeeding benefits, breastfeeding myths, positioning, and common breastfeeding problems); daily (except Sundays) in-hospital visits to assist with latch and positioning and to educate regarding infant cues and breastfeeding frequency; up to 7 personalized home visits during the first year postpartum; and telephone support. If available, electric breast pumps were loaned as needed.

To receive prenatal PC visits, controls could self-refer or be referred to the BHP program at no charge. During the hospital stay, controls were routinely visited by BHP PCs during daily rounds, and those desiring PC services after discharge were enrolled in the BHP program.

Intervention Procedures

The intervention group received routine care from the hospital prenatal clinic, postpartum staff nurses, and lactation consultants. In addition, they had

access to 3 prenatal visits, daily in-hospital visits after delivery, and up to 11 postpartum home visits from an SBFPC during the first 6 months postpartum. The SBFPC was offered to intervention group participants and replaced the optional BHP PC available to controls. SBFPC prenatal visits involved assessment of previous breastfeeding experiences/knowledge, personalized education on breastfeeding logistics, the risks of formula feeding, and anticipatory guidance.

During hospitalization, women received ≥ 1 SBFPC visits per day, which were similar in content to those provided by BHP PCs. The SBFPC ensured that intervention participants received a manual breast pump before discharge.

Women could receive up to 11 postpartum home visits after discharge and were provided the SBFPC's work cell phone number. Visits and phone calls were individualized and tentatively scheduled as follows: 3 visits (first week postpartum); 2 visits during each of the second, third, and fourth weeks; and weekly visits during weeks 5 and 6. Participants were contacted by telephone between 2 and 3 months postpartum, with additional calls and home visits provided as needed. Participants received a large breastfeeding sling to facilitate close infant contact and discreet breastfeeding. Those separated from their infant due to work or school received a single electric breast pump with correctly sized flanges.

PC Training

The SBFPCs ($n = 2$) were bilingual Hartford residents who had breastfed at least 1 child for ≥ 6 months and received specialized training. They received the same 30 hours of classroom training as BHP PCs, utilizing a combination of the BHP²⁶ and La Leche League curricula.²⁷ Topics covered included the following: breast anatomy and physiology, management of breastfeeding,

client-centered counseling skills, and related cultural and social factors. After this training, SBFPCs shadowed experienced PCs for 3 to 6 months, gradually progressing to direct care under International Board Certified Lactation Consultant supervision. In addition, the SBFPCs received 20 hours of specialized training on obesity and EBF. Obesity topics included breastfeeding after cesarean delivery, delayed lactogenesis, body image sensitivity, positioning for large breasts, discreet breastfeeding techniques, and research updates on maternal weight loss and childhood obesity in relation to breastfeeding. EBF topics included risks of formula feeding, contraceptive effect of EBF, symptoms of infant dehydration, and motivational interviewing techniques. Close contact with the study coordinator was maintained through daily communication and weekly case reviews.

Data Collection

All data were collected by a bilingual/bicultural interviewer (not a PC) in the participant's preferred language (English/Spanish). Prenatal data collection included basic demographics at recruitment (Table 1) and a 36-week gestation telephone interview assessing previous breastfeeding experience, and intended breastfeeding duration. Within 24 hours after delivery, participants were interviewed to collect data on infant feeding practices and PC contact. Medical records were reviewed to obtain labor and delivery data, and infant anthropometrics. Breastfeeding self-efficacy was assessed at recruitment, the day of delivery, and 2 weeks postpartum. The previously validated Breastfeeding Self Efficacy scale²⁸ was pretested with 10 local Latinas, and minor modifications were made before collecting data (statements reformatted as questions, removed "satisfaction" question due to poor understanding). The "avoiding formula" and "breastfeed

every feeding" questions were removed before data analysis because responses revealed poor comprehension.

Women were followed-up at 2 weeks postpartum and then monthly through 6 months postpartum to assess infant feeding method (daily frequency of breastfeeding, expressed breast milk feeding, formula feeding, other solids, and liquids), infant health outcomes (diarrhea, otitis media, emergency department visits, and hospitalization), maternal variables (employment, amenorrhea, contraceptive use), and PC contact. Maternal recall of infant hospitalization has been previously validated and revealed to have 98% agreement with medical record data during the first 4 months after birth.²⁹ The interviewer was not informed of participants' group assignment but was not completely blinded because she collected PC contact data. To minimize potential bias, PC contact questions were asked at the end of each interview. Data collection ended in March 2010.

Breastfeeding Definitions

Breastfeeding outcomes (initiation, any breastfeeding, and EBF) were reported as dichotomous variables at birth, 2 weeks, and monthly through 6 months postpartum. EBF was defined in accordance with the World Health Organization definition³⁰ and excluded infants receiving water, formula, juice, tea, or any other solids/liquids. At each follow-up interview, breastfeeding exclusivity was assessed in the past 24 hours, past week, and since birth. Breastfeeding intensity was calculated as the number of breast milk feedings per day (direct breastfeeding + expressed breast milk), divided by the sum of breast milk feeding + formula feeding sessions per day. Breastfeeding intensity was categorized as $\geq 50\%$ vs $< 50\%$. Previous breastfeeding experience was reported as the total months of breastfeeding for all previous pregnancies.

TABLE 1 Subject Characteristics in the Breastfeeding Education and Support Trial for Overweight and Obese Women

	Intervention Group (n = 76)	Control Group (n = 78)
Demographic variables		
Maternal age, y, median (interquartile range)	23 (21–28)	25 (22–31)
Maternal education, y, median (interquartile range)	12 (10–12)	12 (10–12)
Married/cohabitating, %	47.9	54.8
Employed prenatally, %	34.2	30.6
Receiving SNAP, %	40.8	48.7
Receiving WIC, %	88.2	85.9
Born in the United States/Puerto Rico versus Other	57.1	55.1
Ethnicity, %		
Hispanic	80.3	83.3
African American	13.2	7.7
White	5.3	5.1
Other	1.3	3.8
Hispanic origin, %		
Puerto Rican	51.6	49.2
Mexican	17.7	24.6
Other	30.6	25.8
Biomedical variables		
Prepregnant BMI, median (interquartile range)	32.0 (29.3–37.0)	31.6 (28.5–34.9)
Parity, median (interquartile range)	2.0 (1–2)	2.0 (1–3)
Breastfeeding self-efficacy at recruitment, median (interquartile range)	44.0 (40–51)	45.0 (41–51)
Breastfed as child, %	52.6	55.8
Delivery variables		
Infant birth wt, kg, mean $\pm$ SD	3.5 $\pm$ 0.4	3.4 $\pm$ 0.4
Infant gestational age, wk, mean $\pm$ SD	38.7 $\pm$ 3.8	39.0 $\pm$ 1.2
Delivery mode, %		
Vaginal	67.1	55.1
Scheduled cesarean	11.8	30.8
Unscheduled cesarean	21.1	14.1
Analgesia type, %		
None	9.2	12.8
General	0	1.3
Local	1.3	2.6
Spinal	18.4	28.2
Epidural	65.8	50.0
Spinal and epidural	5.3	3.8
General and epidural	0	1.3
Infant gender, %		
Boy	40.8	51.9
Girl	59.2	48.1

SNAP, Supplemental Nutrition Assistance Program.

Statistical Analysis

Sample size estimations indicated the need for 76 subjects per group, based on 80% power to detect a 15% difference in EBF rates at 3 months and a 2-tailed α probability level of .05. We increased the minimal sample size by 35% to allow for attrition and recruited 103 participants per group. Study group (intervention versus control) was the independent variable.

The primary dependent variables were breastfeeding initiation and the rates of

exclusive and any breastfeeding at 2 weeks, 1 month, 3 months, and 6 months postpartum. Secondary outcomes included infant morbidity (diarrhea, otitis media, emergency department visits, hospitalization), maternal amenorrhea, and breastfeeding intensity.

Baseline differences between groups were assessed by using χ^2 analyses, Student's *t* tests (if normally distributed), and Mann-Whitney *U* tests (if not). As previously recommended,³¹ baseline group differences with $P \leq .25$

in bivariate analyses (age, delivery mode, infant birth weight, previous breastfeeding experience in months, and infant gender) were included in the logistic regression models, along with variables of biological importance (prepregnancy BMI). Logistic regression models were used to evaluate differences in breastfeeding outcomes (rates of any and EBF at 2 weeks, 1 month, 3 months, and 6 months); breastfeeding intensity at these time points; infant health outcomes (diarrhea, otitis media, emergency department use, hospitalization) at 3 and 6 months; and amenorrhea. At each time point, EBF was evaluated with 3 definitions (since birth, past week, and past month). In total, 28 multivariate logistic regression models were evaluated. Results were expressed as adjusted odds ratios (aORs) with 95% confidence intervals (CIs). All analyses were by intention-to-treat. Multivariate model fitness was assessed with the Hosmer-Lemeshow test.

RESULTS

Of the 206 participants, 154 (76 intervention, 78 controls) met inclusion criteria at delivery and were included in the analytical sample (Fig 1). Participants were primarily unemployed Latinas, with a high school education, giving birth vaginally (Table 1). The intervention group was significantly younger and differed in delivery mode, compared with controls.

More intervention group (versus control) participants reported ≥ 1 prenatal PC home visit (77% vs 20%, $P < .0001$). Receipt of ≥ 1 in-hospital PC visit was similar between groups (92% vs 87%, respectively). At 2 weeks postpartum, 94% of the intervention group and 40% of controls reported having a PC ($P < .001$). Of those reporting positively, 94% of the intervention group and 68% of controls reported at least 1 postpartum home visit ($P = .001$).

FIGURE 1
Study design. ^a Unable to contact by telephone.

Overall, intervention participants reported significantly more PC contact than controls (Table 2).

Bivariate Analyses

There were no significant group differences in breastfeeding initiation (99% in both groups), or rates of any breastfeeding (Fig 2) or EBF, regardless of the EBF definition used (Table 3). At 2 weeks postpartum, the intervention group had marginally higher rates of any breastfeeding (93% vs 84%, $P = .09$) and were providing $\geq 50\%$ of feedings as breast milk (81% vs 67%, $P = .08$), compared with controls. Among women completing the Breastfeeding Self

Efficacy scale at 2 weeks postpartum, Breastfeeding Self Efficacy scores were significantly higher in the intervention group ($P = .007$; Table 4). Through 6 months postpartum, breast pump use was similar between study groups, except at 2 weeks postpartum with 65% of intervention participants and 42% of controls reporting use ($P = .01$).

Significantly fewer intervention group infants were hospitalized in the first 3 (10% vs 26%, $P = .03$, $n = 103$) and 6 months after birth (11% vs 28%, $P = .03$, $n = 93$), compared with controls. Four intervention infants were hospitalized (1 each for cold symptoms, vomiting, high bilirubin, and adverse vaccine reaction).

TABLE 2 Exposure to SBFP (Intervention Group) and Breastfeeding Heritage and Pride Peer Counseling (Control Group)

	Intervention Group, Median (Interquartile Range)	Control Group, Median (Interquartile Range)	<i>P</i>
Total no. of prenatal visits	2 (0–3)	0 (0–0)	.000
Total time spent at each prenatal visit, h	1 (0–2.75)	0 (0–0)	.000
Total no. of perinatal visits	3 (2–5)	2 (1–3)	.005
Total time spent at perinatal visit, h	1.5 (0.6–3.75)	0.5 (0.25–1.25)	.000
Total no. of postpartum home visits	5.0 (2–8)	0 (0–2)	.000
Total no. of postpartum phone calls received	9.0 (4–13)	0 (0–5)	.000

Thirteen control infants were hospitalized (fever [4], breathing difficulty [3], respiratory syncytial virus [2], cold symptoms [1], IV antibiotics [1], urinary tract infection [1], and stomach surgery [1]). There were no differences in the rates of otitis media or emergency department visits by group. In these unadjusted analyses, the intervention group reported higher rates of infant diarrhea at 6 months postpartum (but not at 3 months). There were no differences in maternal amenorrhea, among women using nonhormonal contraception methods, at 3 months in the intervention and control groups (35% vs 41%, respectively; $P = .67$).

Multivariate Logistic Regression Analyses

Multivariate logistic regression analyses revealed no significant effect of the intervention on rates of any breastfeeding beyond 2 weeks, nor in the rates of EBF at any time point, regardless of the EBF definition evaluated. Assignment to the intervention group was the only significant predictor of any breastfeeding at 2 weeks (aOR: 3.76 [95% CI: 1.07–13.22]). Predictors of giving $\geq 50\%$ of feedings as breast milk at 2 weeks included being in the intervention group (aOR: 4.47 [95% CI: 1.38–14.50]), higher maternal age (aOR: 1.16 [95% CI: 1.02–1.33]), greater previous breastfeeding experience (aOR: 1.31 [95% CI: 1.06–1.61]), and female infant gender (aOR: 3.29 [95% CI: 1.07–10.16]; Table 5).

Infants in the intervention (versus control) group had significantly lower odds of being hospitalized in the first 3 months (aOR: 0.24 [95% CI: 0.07–0.82]) and 6 months after birth (aOR: 0.24 [95% CI: 0.07–0.86]). Logistic regression analyses revealed no significant association between study group and the prevalence of otitis media, diarrhea, or emergency department visits.

FIGURE 2

Unadjusted rates of any breastfeeding by study group.

TABLE 3 EBF Rates by Study Group, Using 3 Different Intervals to Define the Time Frame of EBF

	Past 24 Hours ^a			Past Week			Since Birth		
	SBFPC, %	Control, %	<i>P</i>	SBFPC, %	Control, %	<i>P</i>	SBFPC, %	Control, %	<i>P</i>
Day 1 pp	44.7	44.9	.99	—	—	—	44.7	44.9	.99
2 wk pp	40.6	32.1	.34	37.5	26.8	.24	21.4	15.2	.34
1 mo pp	33.3	28.3	.55	31.7	27.4	.61	17.6	12.1	.37
2 mo pp	25.4	27.1	.83	25.9	18.6	.35	11.9	11.1	.88
3 mo pp	25.9	19.0	.37	24.1	15.9	.27	5.0	9.4	.49 ^b
4 mo pp	11.7	8.5	.56	10.0	6.8	.74 ^b	1.6	4.8	.62 ^b
5 mo pp	6.8	3.3	.44 ^b	5.1	3.3	.68 ^b	1.6	1.6	.999 ^b
6 mo pp	5.1	0.0	.12 ^b	3.4	0.0	.24 ^b	1.7	0.0	.49 ^b

pp, postpartum.

^a The sample ranged from 76 at day 1 to 59 at 6 mo in the SBFPC group versus 78 and 61 at day 1 and 6 mo, respectively, for controls.

^b Fisher's exact test used. All other analyses were *t* tests.

TABLE 4 Breastfeeding Self Efficacy Scores and Their Change Over Time by Study Group

Breastfeeding Self Efficacy Scores, Median (Interquartile Range)					
	<i>N</i>	Intervention Group	<i>N</i>	Control Group	<i>P</i>
Recruitment	76	44 (39–51)	75	45 (41–51)	.612
Day 1 postpartum	74	50 (43–52)	74	46 (41–52)	.178
2 wk postpartum	57	49 (44–53)	48	46 (38–50)	.007
Change in Breastfeeding Self Efficacy Score, Mean $\pm$ SD					
	<i>N</i>	Intervention Group	<i>N</i>	Control Group	<i>P</i>
Recruitment to day 1 postpartum	74	3.4 $\pm$ 8.6	74	0.94 $\pm$ 7.8	.067
Recruitment to 2 wk postpartum	57	2.4 $\pm$ 7.4	47	–1.5 $\pm$ 7.4	.008

DISCUSSION

This SBFPC intervention, targeting overweight/obese low-income women, had no significant impact on EBF rates during the first 6 months, and was associated with an increased rate of any breastfeeding only at 2 weeks after birth. Analysis of secondary outcomes reveals that the intervention was

associated with increased breastfeeding intensity at 2 weeks after birth and lower rates of infant hospitalization at 3 and 6 months. To our knowledge, this is the first breastfeeding PC randomized trial targeting overweight and obese women. In the only other published breastfeeding interventions targeting obese women, Rasmussen et al²²

demonstrated that 2 low-intensity interventions (telephone-based support and breast pump provision) were not successful in increasing the duration of any or EBF. Our results, in combination with those of Rasmussen et al,²² suggest that the breastfeeding barriers experienced by overweight and obese women have not been fully addressed and that further research is needed to understand the etiology of their poor breastfeeding outcomes.

The current breastfeeding results differ from previous PC interventions targeting low-income Latinas. Our previous studies reveal that PC significantly improved breastfeeding initiation among women considering breastfeeding^{23,24} and tended to increase postpartum rates of any breastfeeding.²⁴ In contrast to current results, our previous EBF PC intervention (with no BMI restrictions) increased EBF rates through 3 months postpartum.²³ Similarly, Hopkinson and Konefal Gallagher³² demonstrated that breastfeeding PC clinic appointments significantly increased EBF rates at 4 weeks. These differing results may reflect obesity-related lactation difficulties, improved institutional breastfeeding support in our setting (resulting in nearly universal breastfeeding initiation), or the use of less stringent EBF definitions.³² The SBFPC intervention was associated with improvements in secondary breastfeeding outcomes (higher rates of any breastfeeding and higher breastfeeding intensity at 2 weeks postpartum). These findings may be partially attributable to the significant improvement in Breastfeeding Self Efficacy in the intervention group. We are aware of a single randomized trial designed to increase Breastfeeding Self Efficacy.³³ That intervention significantly increased Breastfeeding Self Efficacy and marginally improved breastfeeding duration and exclusivity.

TABLE 5 Predictors of Breastfeeding Outcomes and Infant Hospitalization

Covariates	Model 1, Any Breastfeeding, 2 wk (<i>n</i> = 129)		Model 2, $\geq 50\%$ Feedings as Breast Milk, 2 wk (<i>n</i> = 106)		Model 3, Infant Hospitalized by 3 mo (<i>n</i> = 99)		Model 4, Infant Hospitalized by 6 mo (<i>n</i> = 90)	
	aOR (95% CI)	<i>P</i>	aOR (95% CI)	<i>P</i>	aOR (95% CI)	<i>P</i>	aOR (95% CI)	<i>P</i>
Study group								
Intervention	3.76 (1.07–13.22)	.04	4.47 (1.38–14.50)	.01	0.24 (0.07–0.82)	.02	0.24 (0.07–0.86)	.03
Control	1.0	—	1.0	—	1.0	—	1.0	—
Maternal age, y	1.16 (0.98–1.37)	.09	1.16 (1.02–1.33)	.02	1.05 (0.94–1.17)	.42	1.07 (0.94–1.20)	.31
Delivery mode								
Scheduled cesarean	0.44 (0.11–1.79)	.25	0.41 (0.10–1.75)	.23	0.69 (0.18–2.69)	.59	0.75 (0.18–3.07)	.69
Unscheduled cesarean	1.96 (0.33–11.49)	.46	1.68 (0.39–7.21)	.48	0.48 (0.08–2.70)	.40	0.39 (0.07–2.30)	.30
Vaginal	1.0	—	1.0	—	1.0	—	1.0	—
Infant birth wt, kg	0.35 (0.07–1.80)	.21	0.54 (0.13–2.17)	.38	3.57 (0.69–18.4)	.13	3.96 (0.72–21.67)	.11
Previous breastfeeding experience, mo	1.22 (0.97–1.55)	.10	1.31 (1.06–1.61)	.01	0.99 (0.94–1.05)	.69	0.98 (0.93–1.04)	.57
Maternal prepregnancy BMI	1.02 (0.90–1.15)	.75	1.05 (0.94–1.17)	.38	1.02 (0.92–1.13)	.70	1.04 (0.92–1.16)	.56
Infant gender								
Girl	1.43 (0.44–4.69)	.55	3.29 (1.07–10.16)	.04	0.63 (0.20–1.95)	.42	0.58 (0.18–1.87)	.36
Boy	1.0	—	1.0	—	1.0	—	—	—
Hosmer-Lemeshow <i>P</i>	.67	—	.66	—	.93	—	.94	—

Our intervention was associated with fewer infant hospitalizations at 3 and 6 months. This was not previously observed and suggests either fewer infections associated with the improved rate and intensity of breastfeeding at 2 weeks or unmeasured aspects of the intervention (ie, increased social support). Although breastfeeding is associated with fewer infant hospitalizations,^{34,35} we know of only 1 other randomized trial revealing this association.³⁶ The intervention did not impact rates of otitis media, diarrhea, emergency department visits, and maternal amenorrhea; however, other breastfeeding interventions have revealed reduced infant morbidity^{23,37–39} and increased rates of amenorrhea.²³

Our results did not support the hypothesized improvements in the rates of any and EBF among those receiving SBFP (except at 2 weeks). This likely reflects unresolved barriers to exclusive and continued breastfeeding (possibly delayed lactogenesis,⁹ mechanical issues related to obesity or breast size,¹³ body image,^{40,41} hormonal profiles,¹⁰ perceived value of WIC formula,⁴² knowledge deficits,⁴³ or misinterpreted infant cues⁴⁴). To sustain the early impact of our SBFP intervention, we must further explore these barriers in this

population. Surprisingly, by 3 months the intervention group (versus controls) tended to be less likely to breastfeed. This may reflect an unanticipated response to the intervention's intensity, which was high during the first 6 weeks postpartum but then became less intensive. Both intervention and control participants did not fully use PC services available to them, although this may reflect PC difficulty in contacting some participants.

This study was conducted in a Baby-Friendly hospital, and may have limited external validity. Because standard care for clinic patients includes PC access at levels considerably more intensive than that typically provided by WIC, our control group received more breastfeeding support than would usually be available. Thus, in less supportive settings, the impact of SBFP targeting overweight/obese women may be more impressive.

Our results may reflect the practices of our study population (82% Latina, with Puerto Ricans comprising 50% of Latinas). While formula supplementation is a common practice among breastfeeding Latinas,⁴⁵ Puerto Ricans typically discontinue breastfeeding sooner

than other Latina subgroups.⁴⁶ EBF rates are suboptimal among all US ethnic groups, but the rates of in-hospital formula supplementation are particularly high among black and Hispanic women,⁴⁷ thus PC interventions among other ethnic groups/subgroups may yield different results.

Our findings are limited by the relatively high loss to follow-up among our low-income, transient population. The resulting decrease in statistical power may explain why breastfeeding rates were not significantly different at 1 and 2 months (Fig 2). In addition, the study relied on maternal report of infant hospitalization; however, this likely had minimal impact on our results because maternal report has been validated against infants' medical record data.²⁹

CONCLUSIONS

This study demonstrates that among overweight and obese, low-income women, SBFP did not improve EBF rates, nor did it improve breastfeeding continuation beyond the first 2 weeks after birth. However, the intervention was associated with improvements in early breastfeeding outcomes (any breastfeeding and intensity at 2 weeks)

and fewer infant hospitalizations through 6 months. Further research is needed to better understand and overcome the factors responsible for the low rates of exclusive and any breastfeeding among overweight and obese women.

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