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The Relationship Between Breastfeeding, Postpartum Depression, and Postpartum Weight in Mexican American Women

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Abstract

Objective—To determine if symptoms of postpartum depression and postpartum weight varied according to the level of breastfeeding among women of Mexican origin at 1 month and 6 months postpartum.

Design—We used data from a parent study in which *promotoras* interviewed new mothers of Mexican origin to encourage appropriate infant weight gain. We performed a secondary quantitative analysis to study the differences in postpartum weight and depression among the mothers in the study who breastfed and those who did not.

Setting and Participants—The study occurred in a heavily Hispanic community located in a major southwest city. The sample consisted of 150 women of Mexican origin who enrolled during their third trimesters in a local Special Supplemental Nutrition Program for Women, Infants, and Children clinic and were followed for 6 months.

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Methods—Weight was measured at 1 month and at 6 months postpartum at home visits with validated digital scales. Breastfeeding was measured with monthly phone calls to record the level of breastfeeding according to World Health Organization criteria. Depression was measured at home visits at 1 month and 6 months by the Edinburg Postpartum Depression Scale.

Results—At 6 months postpartum, women who did not breastfeed had the highest scores on the Edinburgh Depression Scale, while the women who breastfed non-exclusively had the lowest scores ($p = .067$). Considering both time points, there was a significant difference in weight ($p = .017$) between women who were doing any breastfeeding and women who were not breastfeeding.

Conclusions—Breastfeeding, even if not exclusive, contributed to lower depression scores and significantly lower postpartum weight among this sample of Mexican American women.

Keywords

breastfeeding; Mexican American women; postpartum depression; postpartum weight

Exclusive breastfeeding for an infant's first 6 months of life is a global public health recommendation by the World Health Organization (WHO; 2003). The need for exclusive breastfeeding to promote and protect infant health is clear, but the effect of breastfeeding on common postpartum health concerns of women, such as weight and depression, is not as apparent. To make breastfeeding a goal of many new mothers, it may be helpful to demonstrate the benefits for the mother in addition to the infant. This is especially important for low-income minority women because they often weigh more and experience higher rates of postpartum depression than women of European descent (Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012).

The breastfeeding initiation rate among Hispanics is high (80%), but breastfeeding rates drop to 45% at 6 months and further to 26% at 12 months (Allen et al., 2013). Researchers found that the overall rate of exclusive breastfeeding across all racial/ethnic groups dropped to 17% at 6 months with no significant differences according to race/ethnicity (Jones, Kogan, Singh, Dee, & Grummer-Strawn, 2011). One postpartum health concern is depression. Mild depression is experienced by as many as 80% of women in the postpartum period (Workman, Barha, & Galea, 2012), and it is reported that 10% to 20% of women are diagnosed with postpartum depression (O'Hara, 2009; Walker et al., 2004). Rates of postpartum depression among Hispanic women vary from 2.5% (Wei et al., 2008) to 24% (Records et al., 2015) with the variance partially attributed to income, educational level, past history of depression, and social support (Walker et al., 2004). Pitonyak, Jessop, Pontiggia, and Crivelli-Kovach (2016) studied the association between exclusive breastfeeding and depression and found that risk of postpartum depression was associated with lower odds of continued exclusive breastfeeding among women of all ethnic groups.

The effect of breastfeeding on postpartum weight is equivocal. Typically, a woman weighs 1 to 6 lbs more than she did prenatally at 1 year after the birth of her infant (Gunderson & Abrams, 2000). In a systematic review of the literature, Neville, McKinley, Holmes, Spence, and Woodside (2014) concluded that the effect of breastfeeding on postpartum weight was complicated by varied definitions of breastfeeding, the time at which weight was measured,

and the quality of the study methodology. Neville et al. found that overall evidence was insufficient to suggest that breastfeeding was associated with weight loss postpartum, but four of the most rigorous studies reviewed showed a positive association between breastfeeding and postpartum weight loss prospectively at 12 months or longer (Dewey, Heinig, & Nommsen, 1993; Martin, Hure, Macdonald-Wicks, Smith, & Collins, 2014; Ohlin & Rössner, 1990; Østbye, Peterson, Krause, Swamy, & Lovelady, 2012). However, little information is available on the association between breastfeeding and postpartum weight for Hispanic women specifically, and the association between breastfeeding and postpartum depression is inexact. The purpose of our secondary analysis was to examine the relationship of breastfeeding to postpartum weight and depression among Hispanic women up to six months postpartum.

Hispanic/Mexican American Women and Breastfeeding

In a study conducted with mothers enrolled in a Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in Texas, many Hispanic mothers held favorable attitudes toward breastfeeding and infant formula. The mothers in the study who were most positive about breastfeeding were equally as likely to exclusively breastfeed or to use formula along with breastfeeding (Vaaler, Stagg, Parks, Erickson, & Castrucci, 2010). McCann et al. (2007) conducted a nationwide survey of breastfeeding rates among all mothers enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Breastfeeding rates among all participants were lower than those of other U.S. mothers, but Hispanic mothers had the most favorable attitudes toward the benefits of breastfeeding compared to women of other races/ethnicities (McCann, Baydar, & Williams, 2007). In a qualitative study with 21 Mexican American breastfeeding women who were very Mexican-oriented (i.e., were less acculturated to the United States), Wambach, Domian, Page-Goertz, Wurtz, and Hoffman (2016) reported that women with strong family ties and cultural traditions supported breastfeeding; they also cited cultural traditions, such as avoiding negative emotions and certain dietary restrictions, as important to maintain breastfeeding.

Although Hispanic and non-Hispanic White women begin breastfeeding at the same rates, Hispanic mothers who are more acculturated to U.S. mainstream culture have lower rates of continued exclusive breastfeeding than Hispanic mothers who are less acculturated. In a review of 38 research articles on breastfeeding beliefs, attitudes, and practices, Gill (2009) reported that newly immigrated Hispanic women initiated and continued to breastfeed longer than more acculturated women. The Centers for Disease Control and Prevention (2015) reported that Hispanic women begin formula feeding in addition to breastfeeding at higher rates than women of other races or ethnicities. In a study of postpartum women, Gorman et al. (2007) compared less acculturated Spanish-speaking women, more highly acculturated English-speaking Hispanic women, and non-Hispanic White, English-speaking women and found that the more highly acculturated Hispanic women had the lowest rates of exclusive breastfeeding among the three groups.

However, the long-standing differences in breastfeeding rates between newly immigrated and less acculturated Hispanic women and those who were born in the United States (Rassin

et al., 1994) may no longer exist. In recent years, researchers in Mexico (Bueno-Gutierrez & Chantry, 2015; Colchero, Contreras-Loya, Lopez-Gatell, & González de Cosío, 2015) found that exclusive breastfeeding rates dramatically declined among the rural population from 21% in 2006 to 14% in 2012. The reasons for the decline as noted by Bueno-Gutierrez and Chantry were varied but included the association of formula with higher social status, marketing by the infant food industry, and perception of a non-breastfeeding culture.

Significance of Breastfeeding and Relationship to Postpartum Depression

Few authors have examined postpartum depression and breastfeeding in exclusively Hispanic samples. O'Hara, Zekoski, Philipps, and Wright (1990) noted that approximately 10% to 15% of women develop varying levels of depression symptoms after childbirth. Indeed, researchers have found significantly increased rates of postpartum depression (21% to 53%) during the early postpartum period in the Mexican-American population (Beck, Froman, & Bernal, 2005; Davila, McFall, & Cheng, 2009; Gress-Smith et al., 2012; Martinez-Schallmoser, Telleen, & MacMullen, 2003). In contrast, Le, Perry, and Stuart (2011) found unexpectedly low levels of postpartum depression symptoms and rates of diagnosed depression in their clinical trial of an intervention to reduce perinatal depression in psychosocially high-risk Hispanic women. Le et al. did not record any levels of breastfeeding among the women in their sample, so the association of breastfeeding with postpartum depression is not known.

Even though infants greatly benefit from breastfeeding, breastfeeding is less common among mothers with postpartum depression (Field, 2008). In a recent report regarding maternal health outcomes, researchers found that early cessation of breastfeeding was associated with increased risk of postpartum depression in developing countries (Mawson & Xueyuan, 2013). Other findings indicated that postpartum depression was associated with lower breastfeeding rates (Nicklas et al., 2013), and symptoms of depression at 5 months postpartum increased the likelihood of breastfeeding discontinuation (Nishioka et al., 2011). Ystrom (2012) speculated that mothers who breastfeed at birth and continue to 3 months postpartum may be at lower risk for developing depression symptoms that would in turn increase the likelihood of breastfeeding cessation at 5 months. Other authors reported an association between exclusive breastfeeding and decreased rates of poor psychological health (Walker, Sterling, Guy, & Mahometa, 2013). Walker et al. (2013) also reported that Hispanic mothers, relative to non-Hispanic mothers, and mothers not breastfeeding exclusively, relative to mothers who were exclusively breastfeeding, were more likely to experience depression as assessed at 6 weeks postpartum. In this study, however, the researchers did not compare mothers who were exclusively breastfeeding to those who were using formula feeding and breastfeeding.

In a sample of 254 women (27% Hispanic), Hahn-Holbrook, Haselton, Dunkel Schetter, and Glynn (2013) examined the association of early breastfeeding and depression. They followed the women for 2 years and measured frequency of breastfeeding and postpartum depression symptoms, among other variables. The women were largely middle income, educated, and married. Mothers who breastfed more frequently at 3 months postpartum had less depression than women who breastfed less frequently at 3 months; however, there were

no significant differences in the rates of depression based on breastfeeding at 3 months (Hahn-Holbrook et al., 2013).

Wei et al. (2008) examined a tri-ethnic sample of White, African American, and Hispanic women and found that mothers who breastfed and were married had lower rates of postpartum depression. They also found that Hispanic mothers were more likely to be married and to breastfeed and had the lowest rates of postpartum depression compared to mothers in the other two ethnic groups. They concluded that there are strong relationships between postpartum depression and breastfeeding for women of all ethnicities, and those who fed a combination of breastmilk and formula had the lowest rates of postpartum depression.

Call out 1

The Relationship between Breastfeeding and Postpartum Weight

Many women have expressed desires to return to their pre-pregnant weights after giving birth (Walker, Sterling, Kim, Arheart, & Timmerman, 2006). Breastfeeding has been shown to contribute to moderate weight loss, but women who are dissatisfied with their bodies after pregnancy are less likely to breastfeed (Østbye et al., 2012; Walker & Freeland-Graves, 1998). It is important that mothers maintain realistic weight loss goals while still within 12 months postpartum (Krause, Lovelady, & Østbye, 2011), as weight retention is not measured until 12 months after birth. New mothers listed three factors that promote weight loss: dieting, increasing physical activity, and breastfeeding; however, their beliefs that breastfeeding reduces postpartum weight began to diminish at 6 months and were almost completely absent by 12 months (Krause et al., 2011).

Unfortunately, women who are overweight and obese and expect to lose weight through breastfeeding can become frustrated because they are not losing weight soon after the birth. Discouraged mothers may discontinue breastfeeding before 6 months and not continue long enough for the weight loss effect to begin (Krause et al., 2011). In a recent systematic review, Bever et al. (2015) concluded that obese women breastfeed for a shorter duration than non-obese women, are less likely to initiate breastfeeding, and are more likely to breastfeed non-exclusively. The authors concluded that the majority of reviewed studies showed correlates of obesity, such as imbalances of hormones and adipokines and the frequency of difficult births, as factors implicated in the reduced incidence and duration of breastfeeding among obese women.

A high body mass index (BMI) before pregnancy can increase a woman's risk for retaining weight at 12 months postpartum (Davis, Zyzanski, Olson, Stange, & Horwitz, 2009). In addition, a considerable body of research has demonstrated that greater pre-pregnancy maternal BMI is associated with reduced initiation rates and shorter breastfeeding duration (Rasmussen, 2007). Kirkegaard et al. (2015) found that the pre-pregnancy BMI strongly contributed to breastfeeding cessation within 6 weeks of breastfeeding initiation. Hatsu, McDougald, and Anderson (2008) found, somewhat paradoxically, that women at 12 weeks postpartum who were exclusively breastfeeding consumed more calories but also lost more

body weight than mothers who non-exclusively breastfed, although the differences were not statistically significant ($p = .08$ and $p = .07$, respectively).

To address the gap in the literature, the purpose of the present study was to determine the relationships between breastfeeding and postpartum weight retention and breastfeeding and postpartum depression. Our secondary data analyses focused on the following questions:

What is the relationship between breastfeeding and postpartum weight in women of Mexican origin at 1 month and 6 months post-birth and what is the relationship between breastfeeding and postpartum depression in women of Mexican origin at 1 month and 6 months post-birth?

Methods

Design

Our study was secondary quantitative analysis of postpartum women of Mexican origin who were enrolled in a parent study to examine an intervention to prevent childhood obesity. The purpose of the secondary analyses reported here was to compare differences in postpartum weight and depression among mothers who breastfed and those who did not regardless of group assignment.

The parent study was a two-group randomized controlled trial; each group included 75 women in their third trimesters of pregnancy at the time of enrollment in a WIC clinic (Reifsnider et al., 2013). For the purposes of the analyses reported here, data from all women in the study, i.e., those in the intervention and control groups, were used to examine the association of breastfeeding to postpartum weight and depression. The study began after receiving approval from three ethics committees (institutional review boards from a university, the state health department, and a large city health department).

Sample

Inclusion criteria for the parent study and thus this secondary analysis were as follows: (a) self-identification as being of Mexican origin, (b) BMI of 25 or greater before conception, (c) able to speak English or Spanish, (d) aged 18 to 45 years old, (e) no previous diagnoses of serious medical or psychological disease, (f) no serious postpartum complications following birth, and (g) able to receive home visits and telephone calls. All participants who were enrolled in the parent study were included in the secondary analysis. Participants were enrolled at their residences during home visits and provided informed consent. Although the intervention focused on supporting breastfeeding, the support and guidance for breastfeeding was designed to prevent obesity in infants, not to encourage postpartum weight loss. No intervention content was focused on diet or physical activity for the women. Accordingly, for the analyses in this report, the results for postpartum depression, weight, and breastfeeding incidence for all postpartum women were included whether from intervention or control group.

Setting

The women in the sample were recruited from a WIC clinic sponsored by the health department of a major southwest city. The clinic is located in an area of the city

characterized by predominantly low-income households and residents who self-identify as Hispanic or Latino. Compared to other areas of the county, which is one of the largest and most populous in the country, the census tracts served by the WIC clinic have some of the lowest average Child Well-Being Index scores and highest rates of births to mothers who do not have high school diplomas (63% vs. 36% for the county as a whole).

Measures

Weight—The weight in pounds of the participants was measured on a validated portable digital scale, and height was measured with a portable stadiometer. Participants were weighed and measured without shoes or heavy external clothing twice, at 1 month and 6 months postpartum.

Depression symptoms—Symptoms of depression were measured with the 10-item Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987). Each EPDS item has a 4-point response scale, and EPDS scores can range from 0 to 30. Higher scores represent more symptoms of depression. The internal reliability (Cronbach's alpha) for the sample in this study was .92. Scores on the EPDS were collected at 1 and 6 months postpartum.

Breastfeeding—Level of breastfeeding was initially measured on a 6-point scale: *exclusive breastfeeding, almost exclusive breastfeeding, high breastfeeding, medium breastfeeding, low partial breastfeeding, and token breastfeeding* as defined by Labbok and Krasovec (1990). These categories were then collapsed into three categories: exclusive breastfeeding (no other foods given), nonexclusive/combo feeding (formula and/or other foods given in addition to breastfeeding), and not breastfeeding. All women who were breastfeeding at any amount at hospital discharge were called monthly to determine breastfeeding status until they reported that they were no longer breastfeeding.

Food insecurity—At 1 month post-birth, one dichotomous (yes/no) item was used to assess current use of food stamps, and one item was used to assess the current frequency of not having enough money to pay for food; five response options ranged from *never* to *weekly*.

Procedures

The research team recruited pregnant women in their third trimesters from the previously described WIC clinic. They were invited to join the parent study upon meeting inclusion criteria. All data were gathered during home visits by a research team member; accuracy was validated with interrater reliability with the principal investigator. During home visits at 1 month post-birth and again at the 6 months post-birth, the team member weighed the participant, and the participant completed the EPDS.

Data Analysis

Based on breastfeeding status at 1 month and 6 months post-birth, women were categorized as exclusive breastfeeding, nonexclusive/combo feeding, or not breastfeeding. All analyses were conducted in a linear mixed model (multilevel regression) framework in

which repeated measures of breastfeeding, postpartum depression, and body weight were treated as being nested within individual participants. We first examined how breastfeeding category at 1 month was related to change in postpartum depression and body weight from 1 month to 6 months post-birth. To examine this association, we tested the interaction between 1-month breastfeeding and time point (1 month vs. 6 months post-delivery) in predicting the outcome measures at 1 month and 6 months, adjusting for food insecurity measures and their interactions with time point.

Next, to examine contemporaneous associations, we used the repeated measurements of breastfeeding to predict repeated measurements of the outcomes (depression score and weight). We drew on the strength of multiple measurements to estimate how breastfeeding at each time point was related to each of the outcome measures at the same time point, accounted for between-person variability in the person-level means (average of scores at 1 month and 6 months post-birth) on the outcome, and adjusted for food insecurity measures at each time point.

Results

At one month, 23.9% of the participants exclusively breastfed, 35.5% non-exclusively breastfed, and 40.6% did not breastfeed. At 6 months, 17.4% of the participants exclusively breastfed, 17.4% non-exclusively breastfed, and 65.2% did not breastfeed. The mean age of the participants was 29.72 ($SD = 5.87$). Although these rates are low, they are consistent with rates reported for mothers who are WIC participants (Sparks, 2011). Most participants' households (80.0%) had annual incomes less than \$30,000, and only 2% had annual income greater than \$40,000. The median average household size was 5 people ($M = 5.2$, $SD = 1.7$), and the median number of children per household was 2 ($M = 2.67$, $SD = 1.57$). Slightly more than half (56.0%) of the participants were born in Mexico. See Table 1 for detailed information on background characteristics.

Predicted Change in Maternal Outcomes at 1 Month Post-Birth

As shown in Tables 2 and 3, the non-significant model-estimated changes in EPDS scores from 1 month post-birth to 6 months within each group were generally quite small and ranged from an estimated 0.33-scale point decrease (no breastfeeding group) to a 1.15-point increase (exclusive breastfeeding group). Neither the average change over time nor the between-group differences in change over time (as seen in the test of the Group x Time Point interaction) was significant ($p = .562$ and $p = .623$, respectively). Likewise, changes in the average likelihood of depression from 1 month to 6 months post-birth and between-group differences in the likelihood of change were also not significant ($p = .289$ and $p = .404$, respectively). The model-estimated increases in mother's weight from 1 and 6 months post-birth (1.68 lbs for exclusive breastfeeding group, 4.57 lbs for non-exclusively breastfeeding group, and 5.48 lbs for no-breastfeeding group) suggested substantial between-group differences; however, these differences were not statistically significant ($p = .460$), due in part to considerable within-group variability.

Call Out 2

Associations Between Breastfeeding Status and Maternal Outcomes—The findings presented in Table 3 illustrate the association between concurrent measurements of breastfeeding and each outcome. For example, the first three means in the 1-month column represent the average EPDS scores at 1 month post-birth for mothers in each breastfeeding category as determined by the 1-month assessment of breastfeeding. The first three means in the 6-month column represent the average EPDS scores in each breastfeeding category as determined at the 6-month assessment. No clear pattern of concurrent within-person association was found for EPDS scores and breastfeeding status ($p = .313$). At 1 month, women who reported no breastfeeding had on average higher, model-estimated EPDS scores ($M = 5.18$) than those who reported exclusive breastfeeding ($M = 3.64$). At 6 months, however, the opposite was true ($M = 4.39$ and $M = 5.43$, respectively). Of note is the fact that those reporting non-exclusive breastfeeding at either time point had the lowest model-estimated mean EPDS scores at that assessment.

Although EPDS scores and breastfeeding status were not clearly associated when considering both time points, model-estimated prevalence of observed depression risk by breastfeeding status illustrated that participants who reported non-exclusive breastfeeding had less likelihood of depression risk, while those who reported no breastfeeding or exclusive breastfeeding had a greater, model-estimated likelihood of depression risk. This pattern of association between breastfeeding status and depression risk, however, was not statistically significant ($p = .067$).

Weight was linked to breastfeeding status across time points; participants who reported no breastfeeding at either assessment consistently weighed more than those who reported exclusive breastfeeding or non-exclusive breastfeeding (see Table 4). We further explored the concurrent association between breastfeeding status and weight using a dichotomous (none vs. any) measure of breastfeeding formed by collapsing across the non-exclusive and exclusive breastfeeding levels. The pattern of model-estimated means from this exploratory analysis paralleled that seen with the 3-category measure of breastfeeding, in that participants who reported no breastfeeding (1 month: $M = 179.59$ lbs, $SE = 32.82$; 6 months: $M = 187.67$, $SE = 40.07$) weighed more than those who reported any breastfeeding (1 month: $M = 175.17$ lbs, $SE = 32.60$; 6 months: $M = 170.80$, $SE = 25.72$; $b = 5.560$, $SE = 2.297$, $p = .017$).

Post hoc power analyses: To evaluate the power of our focal statistical tests for continuous outcomes, we drew on the approach of Selya, Rose, Dierker, Hedeker, and Mermelstein (2012) approach for deriving f^2 effect size values from mixed model results and sample size calculations as implemented in G*Power (version 3.1, Heinrich-Heine-Universität Düsseldorf, Germany). For tests using the dichotomous EPDS depression risk measure, we drew on our observed data and estimated fixed and random effect parameter values to derive power estimates using a simulation-based approach in R as described by Johnson, Barry, Ferguson, and Müller (2015). Effect size (f^2) estimates along with sample size and alpha values were entered into G*Power to arrive at estimates of the observed power for each test involving continuous outcomes. For the test of Breastfeeding x Time Point interactions,

observed power values for prediction of EPDS scores, weight, and probability of depression risk were .34, .64, and .80 respectively. For tests of concurrent associations between breastfeeding and maternal outcomes, observed power values for prediction of EPDS scores, weight, and probability of depression risk were .57, .96, and .90, respectively.

Discussion

Our results support some findings from previous research but differ from others, especially our finding of a low incidence of postpartum depression and the association of combined breastfeeding and formula feeding on maternal weight status at 1 and 6 months postpartum. In several studies, longer breastfeeding duration was shown to contribute to increased weight loss in the postpartum period. In their study of a large sample of primarily Hispanic and African American mothers in Connecticut, Gould Rothberg et al. (2011) found that each week of breastfeeding led to an additional 1.5-lb loss at 12 months postpartum ($p < .001$). There is some evidence that Hispanic/Latina ethnicity may be associated with lower weight retention after birth. Mothers in the Gould Rothberg et al. (2011) study who identified as Hispanic demonstrated more favorable weight loss trajectories than those of White or African American mothers. Hispanic women who were overweight had a net gain near zero at 1 year postpartum, while Hispanic women who were normal weight or obese exceeded weight retention guidelines by an average of 2 to 5 lbs.

In contrast, Sharma, Dee, and Harden (2014) determined that for mothers who were normal weight or overweight, there was no association between adherence to exclusive breastfeeding and postpartum weight. However, mothers who were obese and exclusively breastfed for 6 months retained less weight (-16 lbs) than those who did not breastfeed. These results closely mirror our findings in a sample of Mexican American mothers with BMIs > 25 (overweight and obese), in which those who exclusively breastfed at 6 months gained a mean of 1 lb from their 1 month postpartum weights, those who did not breastfeed at 6 months gained a mean of 8 lbs from their 1 month postpartum weights, and those who nonexclusively breastfed lost a mean of 9 lbs from their 1 month postpartum weights. When the participants who breastfed at any level were compared to those who did not breastfeed at 6 months, there was an average of 17 lbs difference favoring the breastfeeding participants, which closely mirrors the results of the Sharma et al. (2014) study. It is important to note that exclusive breastfeeding for up to six months remains the recommendation for all infants, but breastfeeding at any amount can be of benefit to mothers.

Postpartum depression is a major concern among women and their families. We found the low level of depression symptom severity in our population surprising, given studies that estimate nearly 20% of U.S. mothers experience a depressive episode in the first 3 months postpartum (Marcus et al., 2003). Several of these studies indicated that symptoms of depression are associated with level of acculturation in Hispanic and specifically Mexican American mothers. Our findings mirror those of Wei et al. (2008), who found that Hispanic women had the lowest levels of postpartum depression at 2.5%. It may be that most participants in our study were more acculturated to the Mexican culture than to the mainstream culture (based on nativity), and the Mexican cultural value of *familia* (close family support that is a common value among women of Mexican origin) contributed to the

low levels of depression symptom severity we observed. This premise is supported by Wambach et al. (2016) and Gorman et al. (2007) who reported that less acculturated mothers were more supportive of breastfeeding and believed it to be consistent with their cultural beliefs.

Strengths and Limitations

Our study has several methodological advantages over earlier studies, such as the use of a prospective rather than retrospective design, use of repeated in-home measurements of maternal weight rather than reliance on self-report, and a sample confined exclusively to Mexican American mothers who were overweight and obese. These factors may increase the internal validity of our outcome measures. We followed women for 6 months after birth whereas many studies concluded at 6 weeks. We also measured breastfeeding in real time by collecting monthly data instead of relying on retrospective data. The participants had very similar ethnic backgrounds, cultural values, and living circumstances. In addition to our intervention, the participants in the intervention group in the primary study received additional education to what is provided by WIC peer educators on breastfeeding and breastfeeding support during home visits. It is not clear if the home measurement visits were a type of social support that could confound the postpartum depression scores.

Implications for Practice

Any level of breastfeeding promoted postpartum weight loss among low-income women of Mexican origin in our study. The calories expended in breastfeeding can help with postpartum weight loss as long as they are not compensated for with increased food intake. Breastfeeding may contribute to lower incidence of postpartum depression, but as postpartum depression is associated with multiple psychosocial risk factors, its contribution is less clear. Nurses who work with childbearing women and especially with low-income women can have a significant effect on the health of postpartum women if they provide clear instructions on breastfeeding and emotional support for new mothers. When future research is conducted on breastfeeding, use of the WHO's definitions of breastfeeding with six levels of response will allow for more accurate comparisons between studies (WHO, 1991).

Conclusion

When our findings are compared to those of previous studies, it is important to point out that inconsistent definitions of breastfeeding continue to complicate between-study comparisons in this area of research. While we found significant differences in postpartum weight among Mexican American mothers who reported any breastfeeding, studies in other populations have shown significant differences only among mothers who breastfed exclusively or who reported a certain percentage of feeds as being at the breast. Our findings highlight the effect that breastfeeding can have on common and potentially harmful conditions such as those of gradual weight accumulation among postpartum women and postpartum depression. Any breastfeeding at both 1 month and 6 months provided a significantly lower mean weight among the participants than did no breastfeeding. Early and sustained breastfeeding for at least 6 months may reduce the chance of women entering their next pregnancies with retained weight from previous pregnancies. Although breastfeeding was not significantly

associated with symptoms of postpartum depression, mothers who breastfed to 6 months had lower mean severity scores than those who did not. Health care providers can use the evidence of weight loss and possibility for reduced symptoms of postpartum depression as a foundation for strongly encouraging and supporting breastfeeding in women of Mexican origin to have a positive effect on the health of maternal-infant dyads. The reassurance that any level of breastfeeding can be beneficial to a mother as well as an infant may be enough emotional support to encourage a woman to begin breastfeeding even if she doubts her ability to exclusively breastfeed.

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Table 1

Sample Demographic Information

	Mean	SD	Minimum	Maximum
Mother's Age	29.72	5.87	18.19	45.59
Number of Children Per Family	2.67	1.57	1	9
Number of Individuals Per Household	5.22	1.71	3	14
	%	N		
Household Income		(150)		
< \$10,000	17.3	26		
\$10,000 – \$30,000	62.7	94		
\$30,000 – \$40,000	18	27		
> \$40,000	2	3		
Breastfeeding at 1 Month		(138)		
Exclusive	23.9	33		
Non-exclusive	35.5	49		
Not Breastfeeding	40.6	56		
Breastfeeding at 6 Months		(132)		
Exclusive	17.4	23		
Non-exclusive	17.4	23		
Not Breastfeeding	65.2	86		

Table 2

Mixed Model Fixed Effect Coefficients, (Standard Errors), p-values from Type III Tests of Fixed Effects, and Random Effects Estimates for Prediction of Maternal Outcomes from 1-Month Breastfeeding Status

Fixed effect ^a	Outcome					
	EPDS score		Weight		EPDS risk	
	b (SE)	p	b (SE)	p	b ^e (SE)	p
Intercept	6.216 (1.337)	-	174.580 (7.364)	-	-0.639 (1.035)	-
Breastfeeding ^b		.207		.602		.077
Exclusive breastfeeding	-0.090 (1.389)		-9.078 (7.659)		-0.395 (0.796)	
Non-exclusive breastfeeding	-1.476 (1.246)		-4.381 (6.853)		-0.665 (0.715)	
Time point ^c		.562		.720		.289
1 month	-0.048 (1.469)		-2.523 (2.982)		-0.698 (1.232)	
Breastfeeding × Time point ^d		.623		.461		.404
Exclusive vs. No breastfeeding × Time point	-1.481 (1.526)		3.797 (3.096)		-0.085 (1.005)	
Non-exclusive vs. No breastfeeding × Time point	-0.692 (1.369)		0.904 (2.780)		-1.696 (1.278)	
Random effect	Estimate (SE)		Estimate (SE)		Estimate (SE)	
Intercept	14.71 (3.56)		1096.49 (141.09)		0.95 (0.61)	
Residual	22.89 (2.88)		92.88 (11.79)		-	

Note.

^a Adjusted for use of food stamps (Food Stamps), having no money for food (No Money), and Food Stamps × Time Point and No Money × Time Point interactions.

^b No breastfeeding is reference category.

^c 6 months is reference category.

^d No breastfeeding and 6 months are reference categories.

^e Logistic regression coefficients.

Table 3

Model-Predicted Means and Standard Errors for Depression and Weight at Each Time Point by 1-Month Breastfeeding Category and Time Point

Outcome	Breastfeeding at 1 month	Time Point			
		1 month		6 months	
		M	SE	M	SE
EPDS score	Exclusive	3.66 ±	1.07	4.81 ±	1.08
	Non-exclusive	3.06 ±	0.88	3.42 ±	0.89
	No breastfeeding	5.23 ±	0.83	4.90 ±	0.86
Depression status ^{a, b}	Exclusive	0.11 ±	0.06	0.07 ±	0.05
	Non-exclusive	0.02 ±	0.02	0.06 ±	0.04
	No breastfeeding	0.17 ±	0.06	0.11 ±	0.05
Mother's weight (lbs)	Exclusive	174.20 ±	6.01	175.88 ±	6.02
	Non-exclusive	176.01 ±	4.94	180.58 ±	4.95
	No breastfeeding	179.48 ±	4.67	184.96 ±	4.71

Note.

^aIf EPDS score > 13, coded = 1 (likely suffering from depressive illness, otherwise coded as = 0).

^bValues represent model-predicted probabilities of likely depressed status and corresponding standard errors.

Table 4

Mixed Model Fixed Effect Coefficients, (Standard Errors), p-values from Type III Tests of Fixed Effects, and Random Effects Estimates for Concurrent Prediction of Maternal Outcomes from Breastfeeding Status

	Outcome					
	EPDS score		Weight		EPDS risk	
	<i>b</i> (SE)	<i>p</i>	<i>b</i> (SE)	<i>p</i>	<i>b^c</i> (SE)	<i>p</i>
Fixed effect^a						
Intercept	5.698 (1.033)	-	172.260 (6.388)	-	-1.194 (0.594)	-
Breastfeeding ^b		.313		.048		.067
Exclusive breastfeeding	-0.039 (1.039)		-4.013 (3.561)		-0.112 (0.524)	
Non-exclusive breastfeeding	-1.237 (0.862)		-5.828 (2.348)		-1.814 (0.780)	
Random effect	Estimate (SE)		Estimate (SE)		Estimate (SE)	
Intercept	14.68 (3.52)		1061.87 (136.03)		0.95 (0.61)	
Residual	22.90 (2.84)		99.45 (12.52)		-	

Note.

^a Adjusted for use of food stamps (Food Stamps) and having no money for food (No Money).

^b No breastfeeding is reference category.

^c Logistic regression coefficients.

Table 5
Observed Means and Standard Deviations for Depression and Weight by Breastfeeding Category and Time Point

Outcome	Breastfeeding at 1 month or 6 months	Time Point ^a			
		1 Month		6 Months	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
EPDS score	Exclusive	3.64 ±	5.56	5.43 ±	6.79
	Non-exclusive	3.04 ±	4.42	3.04 ±	3.77
	No breastfeeding	5.18 ±	6.97	4.39 ±	6.99
Depression status ^{b, c}	Exclusive	0.12 ±	0.33	0.13 ±	0.34
	Non-exclusive	0.02 ±	0.14	0.04 ±	0.21
	No breastfeeding	0.18 ±	0.39	0.13 ±	0.34
Mother's weight (lbs)	Exclusive	174.16 ±	25.85	175.25 ±	26.06
	Non-exclusive	175.84 ±	36.70	166.36 ±	25.15
	No breastfeeding	179.59 ±	32.82	187.67 ±	40.07

Note.

^aEach mean corresponds to the breastfeeding category as determined at the time point at which the outcome was assessed.

^bIf EPDS score > 13, coded = 1 (likely suffering from depressive illness, otherwise coded as = 0).

^cValues represent model-predicted probabilities of likely depressed status and corresponding standard errors.