ORIGINAL ARTICLES

Postpartum Weight Loss and Infant Feeding

Laura N. Haiek, MD, MSc, Michael S. Kramer, MD, Antonio Ciampi, PhD and Rossana Tirado, MD

Background: **Women are often advised that lactation accelerates loss of the excess weight gained during pregnancy, but the evidence underlying this advice is sparse and conflicting. To help fill this gap, we assessed differences in the rate of postpartum weight loss in the first 9 months postpartum according to method of infant feeding.**

Methods: **Two hundred thirty-six women attending two public health clinics in Montreal were weighed in one to four routine infant immunization visits up to the 9th postpartum month. After each weighing, we administered a telephone questionnaire assessing the method of infant feeding (predominantly breast-feeding, mixed-feeding, or predominantly bottle-feeding) and potential confounders. Data were analyzed using unbalanced multivariate repeated measures linear regression.**

Results: **Infant feeding was not associated with statistically significant differences in the rate of weight loss. Gestational weight gain, postpartum smoking, and maternal birthplace were important predictors of postpartum weight change.**

Conclusion: **Although our results cannot exclude an effect of more exclusive or more prolonged breast-feeding, breast-feeding as commonly practiced does not appear to influence the rate of postpartum weight loss. This information should be useful in counseling new or prospective mothers and in avoiding unrealistic expectations. (J Am Board Fam Pract 2001;14:85–94.)**

It is not yet clear whether women who lactate lose the weight gained during pregnancy faster than their nonlactating counterparts. The available information comes from studies designed primarily to study the energy cost of human lactation[1–12] or the relation between pregnancy-parity and the development of obesity.[13–26] The information provided in these studies suggests that in the first 3 months postpartum, the rate of weight loss is similar in lactating and nonlactating women.[4,5,9–12] Several studies have reported that women who lactate longer and more intensively (ie, 5 to 6 months of exclusive or nearly exclusive breast-feeding) lose weight more rapidly between 3 and 6 months postpartum[9,10,15,23] or retain less weight by 12 months postpartum[9,24,26] than women who exclusively bottle-feed or those who lactate less fully or for a shorter duration. Three of these latter studies, however, are based on small, highly selected samples of women from middle- and upper-socioeconomic backgrounds,[9,10,24] and their generalizability might therefore be rather limited. Of the two larger epidemiologic studies, one[15] dates from the 1960s, whereas the magnitude of the effect reported in the other[23] was extremely small, albeit statistically significant.

Attitudes and beliefs toward postpartum weight change have not been extensively explored, among either mothers or health professionals. Most nursing and nutrition textbooks claim that women return to their prepregnant weight between 6 weeks and 6 months after delivery.[27–29] Some widely accessible lay books and information pamphlets state that women regain their prepregnancy figure faster if they breast-feed.[31–34] For example, an information pamphlet from La Leche League states that breast-feeding will help mothers lose the extra fat deposited during pregnancy as an energy reserve to subsidize the cost of lactation, whereas mothers who bottle-feed must rely on dieting and exercising to lose weight postpartum.[33] Other authors postulate that weight loss during the puerperium is of great concern to mothers,[2,10,25,30,35] but the knowledge women have or the advice they receive with

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From the Departments of Epidemiology and Biostatistics (MSK, AC), Family Medicine (LNH, RT), and Pediatrics (MSK), McGill University Faculty of Medicine, Montreal, Quebec. Address reprint requests to Laura N. Haiek, MD, MSc, Family Medicine Center, St-Mary's Hospital, 3830, Lacombe Ave, Montreal, Quebec, Canada H3T 1M5.

respect to anticipated weight change is not well documented.

It is likely that maternal attitudes play a role in the success of lactational performance. For example, the findings reported by Dusdieker et al[36–38] indicate that mother-centered beliefs play a crucial role in the decision to breast-feed. These beliefs can also affect the duration of breast-feeding.[36] Similarly, Manning-Dalton and Allen[2] speculate that in our weight-conscious society, women might make the decision to breast-feed in the hope of losing weight. They further postulate that if weight loss does not occur as fast as expected, these women might become frustrated, perhaps leading to adverse emotional consequences for both the mother and her infant. If this happens, women might be more likely to restrict food intake. This outcome would not be surprising, since several authors have reported that many lactating women consciously diet.[39–41] Although it has been documented that postpartum dieting to achieve moderate weight reduction is compatible with normal lactation,[42–44] short-term energy restriction to levels less than 1,500 kcal/d led in at least one study to a considerable reduction in milk production.[7] If prolonged, such energy restriction could possibly lead to cessation of breast-feeding. If women could be given appropriate advice on the most likely rate of weight loss and the effects of different degrees and duration of breast-feeding, these negative consequences of excessive energy restriction might be avoided and the duration of breast-feeding thereby prolonged.

The study reported here was designed to clarify whether women from various socioeconomic and ethnic backgrounds experiencing different degrees of lactation lose the weight gained during pregnancy faster than their nonlactating counterparts. Hence, the primary objective of the study was to examine the effect of infant feeding method during the first 9 months postpartum on the rate of postpartum weight loss in a well-nourished, multiethnic population in Montreal.

Methods

Sample Selection

Study participants consisted of women who brought their infants to immunization clinics at two sites of a community health center in the city of Montreal, Quebec, Canada. The health center serves a multiethnic urban population of approximately 120,000 inhabitants in the downtown Montreal area with a high rate (25% to 30%) of single-parent families.[45]

A woman was considered eligible to participate if her infant was 8 months of age or younger and was the product of a singleton gestation with a birth weight of 2,000 g or more, if neither she or her infant had had a life-threatening illness, and if she was not pregnant at the time of the recruitment.

Data Collection

Mothers were recruited at the immunization clinics while waiting for their child's visit either by the clinic nurses or by one of the authors (LNH or RT). If the mother agreed to participate, she was weighed and measured. Thereafter, she was contacted by telephone by one of the investigators (LNH), who then administered the initial study questionnaire. This questionnaire included a verbal consent to participate and questions about infant feeding. The mother was asked initially whether she was fully breast-feeding, fully bottle-feeding, or using both feeding methods. If she was both breast- and bottle-feeding, detailed information was requested on the average daily quantity and size of bottles of formula consumed during each month since birth. The mother was also asked whether the infant was taking foods other than milk, such as solids and juices. If so, she was questioned about the age when each food item was introduced. She was also questioned about her work, exercise, diet, and smoking practices since the birth. Because the interviewer was trilingual (English, French, and Spanish), few cases needed an interpreter.

Baseline sociodemographic and obstetric characteristics were extracted from the medical record. When this information was not available or was incomplete, it was collected by telephone interview. In the few cases when the participant was uncertain of her prepregnancy weight or gestational weight gain, the accuracy of the reported weights was verified with the physician providing prenatal care. If this information was unavailable, the participant was deleted from the analysis.

Whenever possible, the mother was weighed at all subsequent clinic visits until the 9th month postpartum. Thereafter, each participant was contacted by telephone, and a follow-up questionnaire was administered to inquire about type of infant feeding (assessed as in the initial questionnaire) and her work, exercise, diet, and smoking practices since the time of the previous contact. If a woman became pregnant again during the follow-up period, only the prepregnancy weights were retained for analysis.

Inherent to this design is that study women participated during different periods postpartum, for different lengths of time, and with different numbers of contacts and intervals between contacts. With respect to the terminology used below, the overall follow-up period is considered as the time between delivery and the last clinic visit, and an interval is defined as the time between delivery and the first clinic visit or between any two subsequent visits. For example, a participant with two visits to the clinic has three data points (delivery, first visit, and second visit), the overall follow-up period is the time between the delivery and the second visit, and the two intervals are the time between the delivery and the first clinic visit and the time between the first and second visits.

Definitions of Variables

The principal outcome variable was the average monthly rate of weight change (in kilograms per month) during the interval. During each visit to the clinic, mothers were weighed without shoes or coat on a beam balance. The outcome variable was computed using these weights and the mother's self-reported estimate of weight after delivery. Measured postdelivery weights were not available because (1) women attending the clinic gave birth in different hospitals and saw different physicians at their routine 6-week postpartum office visits, making it difficult to obtain a baseline early postdelivery weight; and (2) many women gave birth before the study began. To estimate postdelivery weight, we added each mother's self-reported prepregnancy weight and her gestational weight gain, and then subtracted the self-reported birth weight of the infant and an estimate of the weight of the placenta and amniotic fluid (placental weight = 1/6 of baby's birth weight, amniotic fluid weight = 1 kg). The rate of monthly weight change for any given interval was then calculated as the difference between two subsequent weights divided by the number of months between weights.

In defining the exposure and other covariates, we distinguished variables representing behaviors that change with time (time-varying factors) from those stable maternal socioeconomic, obstetric, and infant variables that tend to remain constant with time (time-nonvarying factors). Also, to account for differences in length of the intervals and their timing since birth, a time variable was introduced to represent the number of days between birth and the midpoint of the interval comprising two consecutive weights.

The time-varying exposure variable of primary interest was the extent of lactation during the interval. First, an average daily intake of breast milk was calculated for each month of the follow-up period. For this calculation, the reported average daily formula intake in each month was subtracted from published age-specific estimates of breast milk volume among exclusively breast-fed infants.[46] Second, an average daily intake of breast milk was calculated for each interval and was categorized into the following three groups: (1) predominantly breast-feeding, ie, exclusive breast-feeding or average daily intake of formula of 4 oz or less during the interval; (2) mixed-feeding, ie, average daily intake of formula and breast milk of more than 4 oz each during the interval; and (3) predominantly bottle-feeding, ie, exclusive bottle-feeding or average daily intake of breast milk of 4 oz or less during the interval.

The cutoff of 4 oz was chosen because it represents the average size of a bottle feeding in the first few months.

The time-varying covariates were defined as the proportion of time during the interval in which mothers reported those covariates. They included dieting to lose weight, exercising at least once a week, working or studying outside their homes, and feeding their infants solids and juice. Postpartum smoking was defined as the mean number of cigarettes smoked per day during a given interval.

Statistical Analysis

A descriptive analysis was conducted for all time-nonvarying factors for the study sample as a whole, followed by analysis of bivariate associations among the variables. Simple linear regression, *t* test, and chi-square analyses were performed with SAS (Release 6.03 edition, SAS Institute, Cary, NC) when assessing two time-nonvarying continuous or categorical factors. For the bivariate and multivariate analyses involving one or more time-varying factors, BMDP program 5V.8 was used.[47] This program analyzes repeated-measure data sets allowing for unbalanced designs (ie, with missing observations) and time-varying covariates. The specific information contributed by all time-varying factors for the calculation of the regression coefficients refers to a given interval and not to a given participant (eg, the same participant might contribute to the analysis as a predominant breast-feeder in one interval and a predominant bottle-feeder in a later interval). The time-nonvarying covariates contributed the same information for all intervals corresponding to each patient (eg, a participant who is primiparous would remain so for all intervals of the follow-up period).

A simple repeated measures analysis was performed to examine the crude association between method of infant feeding and weight loss. Next, a multivariate repeated measures analysis was performed to control for the effects of several covariates simultaneously. The potentially confounding covariates included in this analysis comprised socioeconomic, gestational, and postpartum characteristics of the study participants that were chosen based on knowledge available from previous research. When several variables were available for one construct (ie, socioeconomic status), the variables included in the model were those significantly associated both with type of infant feeding and with rate of weight change. As mentioned above, the time variable was treated as a covariate to account for differences in length of the intervals and their timing since birth. Both linear and quadratic terms of the time variable were introduced in the model to test whether the relation between time and rate of weight change was quadratic rather than linear.

To estimate the required sample size, the extent of lactation was considered as a dichotomous variable (any breast-feeding vs bottle-feeding), and the mean and standard deviation used for weight loss were those reported by Manning-Dalton and Allen: 2.0 ± 2.4 kg from 12 days to 90 days postpartum.[2] Based on 80% power, a 2-tailed test, and an α level of 0.05, approximately 90 women would be necessary in each group to detect a difference of 1 kg in total weight loss from delivery to 90 days.

Results

During the study period, 242 women were recruited into the study. Three were excluded from the analysis because the overall follow-up period was less than 1 month, and 3 others were excluded because their prepregnancy weight and gestational weight gain were uncertain, and we were unable to confirm them.

Table 1. Maternal Obstetric and Infant Characteristics.

Characteristic	Mean ± SD
Age (years)	28.5 ± 5.8
Prepregnancy body mass index (kg/m^2)	22.5 ± 3.4
Gestational weight gain (kg)	14.2 ± 5.0
Net weight after delivery (kg)	65.7 ± 9.9
Duration of pregnancy (weeks)	39.4 ± 1.5
Birth weight (kg)	3.3 ± 0.5
	Percent
Parity (primiparous)	55.1
Type of delivery (vaginal)	84.3
Montreal Diet Dispensary (attendance)	23.8
Gestational smoking (any smoking)	9.3
Postpartum smoking (any smoking)	13.4
Marital status (married)	69.5
Living situation (living with partner)	85.5
Source of income (work)	66.1
Birth place (Canadian or US born)	29.8

Table 1 displays the baseline obstetric and sociodemographic characteristics of the 236 women retained for the analysis. The mean age at delivery was 28.5 years, and 55.1% were primiparous. The mean years of completed education was 13.3, 85.5% of the women were living with a partner, and 66.1% stated that the source of family income was work. Only 29.8% of the participants were born in the United States or Canada; the remainder were born in other countries (30% Latin American, 30% Asian) representing a diverse ethnic mix. Of the 195 women who started breast-feeding, 143 did so exclusively at birth, whereas 52 supplemented their infants with formula from birth. The mean (± standard deviation [SD]) age at introduction of juices was 76 (± 75) days; for solid foods, it was 106 (± 45) days.

The average length of time between delivery and the last weight obtained at a clinic visit was 189 ± 44 days. The mean number of study visits to the clinic at which a weight was obtained was 2.0 ± 0.8 (range 1–4); 32.2% of women had only one study visit at which a weight was obtained; 43.2% had two visits, 20.3% had three visits and 4.2% had four visits.

Most of the study women lost weight during the postpartum period, but a considerable number weighed more at the last clinic visit than (estimated) after delivery. Of the 181 women who had

Table 2. Crude (Unadjusted) Overall Rate of Weight Change (in kg/mo) Overall and According to Feeding Group.

Time Period and Group	Mean	95% Confidence Interval	No.*
Delivery to 3–5 months			
All participants	−0.93	−1.14, −0.72	125
Predominantly breast-feeding	−1.05	−1.38, −0.75	43
Mixed-feeding	−0.66	−1.44, −0.84	50
Predominantly bottle-feeding	−1.14	−1.53, −0.72	32
Delivery to 6–8 months			
All participants	−0.72	−0.84, −0.60	176
Predominantly breast-feeding	−0.63	−0.84, −0.42	51
Mixed-feeding	−0.72	−0.90, −0.54	76
Predominantly bottle-feeding	−0.81	−1.02, −0.60	49
3–5 months to 6–8 months			
All participants	−0.45	−0.63, −0.27	89
Predominantly breast-feeding	−0.24	−0.54, −0.06	21
Mixed-feeding	−0.21	−2.73, −0.15	14
Predominantly bottle-feeding	−0.57	−0.84, −0.30	54

Note: a negative change denotes weight loss.
*Women might contribute more than one time period.

their last weight taken at 182 days (6 months) or later, 31 (17.1%) weighed more at the last clinic visit than after birth.

Table 2 presents the crude (unadjusted) monthly rate of weight change for all participants combined according to feeding group for three standard time periods. Among the 125 women followed from delivery to 3 to 5 months, 43.4% were classified as predominantly breast-feeders, 40.0% as mixed-feeders, and 25.6% as predominantly bottle-feeders. The corresponding proportions for the 176 women followed from delivery to 6 to 8 months were 29.0%, 43.2%, and 27.8%, respectively. For the 89 women followed between 3 to 5 and 6 to 8 months, the proportions were 23.6%, 15.7%, and 60.7%. As shown in Table 2, the crude (unadjusted) postpartum weight change was similar among the three feeding groups for all three standard time periods. For none of the periods was the rate of weight loss greater in the predominantly breast-feeding group.

Next, a crude (unadjusted) repeated measures analysis was performed with all the data points defining the intervals for all 236 women. When the predominantly breast-feeding group was defined as the reference group, mixed- and bottle-feeding were associated with a nonsignificant decrease in the rate of weight loss relative to the predominantly breast-feeding group (data not shown).

Table 3 summarizes the crude (bivariate) associations for potential determinants other than infant feeding, including sociodemographic, gestational, and postpartum factors. Gestational weight gain, smoking during pregnancy and postpartum, postpartum employment outside the home, intake of solids and juice, gestational age at birth, marital status, clinic attended, maternal birthplace, and the average time between birth and the interval were all significantly associated with postpartum weight change.

The final multivariate regression model is displayed in Table 4. Neither mixed-feeding nor predominant bottle-feeding was significantly associated with postpartum weight change, even after controlling for potential confounders. Gestational weight gain, postpartum smoking, the proportion of an interval during which solids were taken, maternal birthplace, and the time variable were all significant predictors of weight change. The regression coefficient for the quadratic term of the time variable was also statistically significant, indicating that the relation between rate of weight loss and time (after controlling for other covariates) was quadratic, rather than linear. The regression coefficient for this second-order term (t^2) was in the opposite direction from that of the linear term (t). This finding suggests that the rate at which weight is lost differs with time. The minimum point in the curve is at 4.7 months, indicating that in the first 4.7 months the rate of weight loss is faster closer to birth (consistent with postpartum diuresis), whereas after 4.7 months, the rate of weight loss is faster the longer after birth.

A final regression analysis was performed to test for the possible modifying effect of time on the relation between infant feeding and postpartum weight change by including all the variables presented in Table 4 plus an interaction term between time and infant feeding. This interaction was not statistically significant (data not shown).

Discussion

We found no significant differences in the rate of weight loss in the first 9 postpartum months ac-

Table 3. Repeated Measures Analysis of the Effect of Socioeconomic, Gestational, and Postpartum Factors on Monthly Rate of Weight Change.

Variable	Regression Coefficient (β)	95% Confidence Interval
Continuous		
Prepregnancy body mass index	0.03	−0.03, 0.09
Maternal height	−1.95	−4.14, 0.24
Gestational weight gain	−0.09	−0.12, −0.07
Gestational age at delivery	−0.18	−0.27, −0.06
Birth weight	−0.24	−0.57, 0.09
Maternal education	−0.01	−0.06, 0.03
Maternal age at delivery	0.01	−0.01, 0.03
Postpartum employment	0.63	0.12, 1.14
Postpartum exercise	0.21	−0.24, 0.66
Postpartum dieting	0.48	−0.18, 1.14
Postpartum smoking	−0.03	−0.06, 0.01
Solids intake	1.20	0.84, 1.56
Juice intake	0.78	0.36, 1.23
Time variable	0.009	0.003, 0.015
Dichotomous		
Parity	−0.15	−0.30, 0.006
0 = primiparous		
1 = multiparous		
Martial status	−0.18	−0.33, 0.006
0 = single, separated, divorced		
1 = married		
Living situation	−0.09	−0.30, 0.09
0 = alone		
1 = with partner		
Maternal birthplace	−0.30	−0.45, −0.15
0 = Canada, United States		
1 = other		
Gestational smoking	0.42	0.18, 0.66
0 = no smoking		
1 = any smoking		
Attendance at Montreal Diet Dispensary	−0.03	−0.21, 0.15
0 = no		
1 = yes		

Note: negatie change denotes weight loss.

cording to whether mothers predominantly breast-fed, predominantly bottle-fed, or mixed-fed their infants. Moreover, no such association was observed even after adjusting for potential confounders.

In the multivariate repeated measures analysis, several variables proved to be significant predictors of postpartum weight change. Women who gained more weight during pregnancy had faster rates of postpartum weight loss. This finding is consistent with those of previous reports.[2,9–11,25] Women who smoked at all during a given interval lost weight faster than those who did not smoke. The association between postpartum smoking and postpartum weight loss has been previously reported.[23,25] The infant's receipt of solids for a large proportion of the interval reduced the rate of weight loss. This latter finding might represent a decrease in energy expenditure (ie, babies who consume more solids decrease their milk intake, and their mothers therefore require less energy for milk production) among breast-feeding mothers. Among bottle-feeding mothers, however, it might represent a marker for maternal attitudinal or lifestyle factors related to diet or physical

Table 4. Multivariate Repeated Measures Analysis of Monthly Rate of Weight Change (Outcome Variable), Type of Infant Feeding (Exposure Variable), and Various Sociodemographic, Gestational, and Postpartum Covariates.

Variable	Regression Coefficient (β)	95% Confidence Interval
Constant	−1.26	−1.95, −0.57
Type of infant feeding		
Breast-feeding (reference)	—	—
Mixed-feeding	0.09	−0.24, 0.42
Bottle-feeding	−0.09	−0.42, 0.24
Gestational weight gain	−0.09	−0.12, −0.06
Postpartum smoking*	−0.72	−1.14, −0.33
Infant's solid intake†	1.35	1.02, 1.68
Maternal place of birth‡	−0.15	−0.33, −0.03
Time variables§ (t)	0.04	0.02, 0.06
Quadratic term for time variable (t^2)	−0.0003	−0.0006, −0.00012

Note: a negative change denotes weight loss.
*No postpartum smoking during interval = 0; any postpartum smoking during interval = 1.
†Proportion of the postpartum interval in which solids were taken by the infant.
‡Canadian or US born = 0; other = 1.
§Average time in months between birth and two consecutive weights defining a postpartum interval.

activity (eg, mothers who feed the babies more, might eat more, and therefore lose weight more slowly).

Women born in Canada or the United States tended to lose weight more slowly than those born elsewhere. This variable might reflect socioeconomic status; immigrant women were more likely to receive unemployment insurance or welfare, were less educated, had higher parity, and were more likely to be living alone. Despite their general tendency not to smoke, immigrant women gained less weight during pregnancy and were more likely to attend the Montreal Diet Dispensary for dietary counseling and food supplementation. These findings do not help explain the observed effect of maternal birthplace on rate of weight change, however, because the effect persisted after controlling for these variables. Maternal birthplace might have captured other aspects related to diet, physical activity, or metabolism not adequately measured by other covariates. It is worth noting that the immigrant group comprised a diverse ethnic mix. Women belonging to some ethnic groups might have culturally-based restrictions on maternal diet or behavior that run counter to clinical advice.[40] Whether these ethnic differences are important for short- or long-term maternal health remains an open question.

It is known that mothers who choose to breast-feed differ in important attitudinal aspects from those mothers who bottle-feed.[13] If these attitudes influence the rate of weight loss, then the association between lactation and weight loss might be confounded. Unfortunately, owing to study design and feasibility issues, the only attitudinal measures recorded were crude, self-reported assessments of lifestyle factors, such as postpartum dieting and exercise practices. Our analysis showed that postpartum exercising was not related to either method of infant feeding or rate of postpartum weight change. Although the proportion of the interval during which women were dieting was significantly greater in the predominantly bottle-feeding group than in the mixed-feeding and breast-feeding groups, there was no relation between postpartum dieting and rate of postpartum weight loss. Moreover, there is no a priori reason to believe that other attitudinal differences associated with breast-feeding would lead to slower, rather than faster, weight loss and thereby negatively confound the association.

Others studies have reported significant associations between postpartum weight loss or retention and several sociodemographic and obstetric variables, such as age,[14,17,23,24] prepregnancy weight,[2] parity,[9,10,20,24,45] and marital status.[24] In our study, these factors were not retained as significant predictors of postpartum weight loss.

Bias in the selection and follow-up of the study sample is also a potential concern. First, the characteristics of the source population (ie, all women attending the clinic for their infants' immunizations) are not known. Although there is no indication that our study sample was biased with respect to the relation of interest, the degree and reasons for mothers' refusal to participate were not recorded. Nonparticipation appeared to be mainly related to lack of interest in participating in a research project. Owing to the study design, there were no losses to follow-up, since every eligible participant with at least one measured weight and the corresponding telephone interview was retained for the analysis.

In our view, however, the most important limitations of this study are related to the definition of both the outcome and the exposure variables. First, two main problems were encountered in defining the outcome variable, rate of weight change: (1) the lack of a documented early postpartum weight, and (2) the need to use self-reported and estimated weights to establish it. Despite these limitations, that well-known associations with weight gain, smoking and time, were reproduced in this study suggests that our definition of the outcome variable was adequate. Second, to measure our exposure variable, method of infant feeding, we assessed (by questionnaire) the average volume of formula consumed, by month, for each infant not exclusively breast- or bottle-fed and estimated the corresponding average breast milk intake using previously validated estimates of age-specific breast milk volumes. Even though this procedure is prone to random error, we considered it acceptable to classify women into feeding categories, despite a certain degree of inevitable nondifferential (and therefore unbiased) misclassification of women whose infant feeding practices lay close to the cutoffs defining the categories. Also, this categorization did not permit us to explore the effect on rate of postpartum weight change of prolonged breast-feeding (ie, sustained lactation for 6 months or more) compared with short-term breast-feeding (ie, less than 3 months) or no breast-feeding at all.

Our study has several methodologic improvements, however, compared with many previous studies. First, the statistical power of the study to detect significant differences in postpartum weight change between feeding groups was enhanced by a larger sample and by using an unbalanced repeated measures analytic strategy, which enabled us to use all data points available for all participants. Second, the choice of an unbalanced repeated measures analytic strategy permitted not only the use of an appropriate multivariate model to control for potential confounders, but also reduced misclassification of the time-varying method of infant feeding and of covariates, thus providing a better estimate of the effects of behaviors (eg, infant feeding, postpartum smoking, etc) that change with time.

Women who plan to breast-feed or who are breast-feeding should be given realistic, health-promoting advice about weight change during lactation.[13] Ideally, they should be advised that it is normal to lose weight during the first 6 months of lactation. The average monthly rate of weight loss is 0.5 to 1 kg after the first month postpartum.[13,48] Although there seems to be no major difference in the rate of postpartum weight loss in women who predominantly breast-feed, mix-feed, or bottle-feed, other studies suggest that women who breast-feed for at least 6 months postpartum might lose weight more rapidly than those who breast-feed for shorter periods and those who do not breast-feed at all.[9,10,15,23,24] Moreover, not all women lose weight in the postpartum period; some women gain weight regardless of whether they breast-feed.

Although breast-feeding should be promoted for its own substantial benefits (for the mother and child), it should not be relied on as a way for well-nourished women to compensate for excessive pregnancy weight gain or to increase postpartum weight loss.[49] Health professionals should elicit the mother's beliefs that reinforced her decision to breast-feed. Women who choose to breast-feed in the hope of losing weight faster might be at risk for terminating breast-feeding prematurely if that hope is unrealized.

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