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Decreased Full Breastfeeding, Altered Practices, Perceptions, and Infant Weight Change of Prepregnant Obese Women: A Need for Extra Support

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What's Known on This Subject

Maternal engagement in health-promoting practices, namely, breastfeeding, plays an essential role in optimal child growth. Prepregnant obese mothers are less likely, however, to initiate and maintain breastfeeding according to current infant-feeding recommendations.

What This Study Adds

This study adds a better understanding of breastfeeding practices, perceptions, and infant weight change of prepregnant obese mothers during the first 3 months postpartum. Extra support is needed during prenatal and early postnatal periods so that their children can benefit from breastfeeding.

ABSTRACT

OBJECTIVE. The purpose of this work was to compare breastfeeding practices, perceptions, and infant weight change of prepregnant obese versus normal-weight mothers in the first 3 months postpartum.

PATIENTS AND METHODS. For the prospective case-control study, obese mothers (prepregnant BMI ≥ 30 kg/m²) were matched with normal-weight mothers ($18.5 \leq$ prepregnant BMI < 25 kg/m²) according to initial infant feeding, parity, maternal age, ethnicity, and education. Participants completed an oral questionnaire in the hospital and a telephone interview at 1 and 3 months postpartum.

RESULTS. Of 1432 mothers who had given birth at a university hospital in France, 10% were obese. Breastfeeding initiation was lower for obese (48%) versus normal-weight (64%) mothers. A total of 111 of 141 obese mothers were paired with 111 normal-weight mothers. Infant birth weight was similar for newborns of obese and normal-weight mothers. Among mothers who initiated breastfeeding, infant weight gain from 0 to 1 month was lower in breastfed infants of obese mothers compared to normal-weight mothers. Obese mothers were less likely to maintain full breastfeeding at 1 month and 3 months. The percentage of mothers breastfeeding to any extent did not differ between obese and reference women. Obese mothers more often felt uncomfortable breastfeeding in public at 3 months. Fewer obese mothers perceived that their milk supply was sufficient at 1 month and 3 months. Despite greater breastfeeding difficulties, obese mothers were less likely to seek support for breastfeeding in the first 3 months postpartum.

CONCLUSIONS. Pediatricians and health professionals should recognize that obese mothers have different breastfeeding practices and perceptions. Extra support and intervention are needed among obese mothers during prenatal and early postnatal periods so that their children can benefit from breastfeeding.

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Key Words

growth, infant feeding, lactation, maternal and child health, nutrition

Abbreviation

CHU—Centre Hospitalier Universitaire

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ACCORDING TO AN American Academy of Pediatrics policy statement, “breastfeeding ensures the best possible health as well as the best developmental and psychosocial outcomes for the infant.”¹ Among health benefits, breastfeeding might protect against childhood obesity.²⁻⁷ However, the apparent protective effects are strongly influenced by confounding, in which maternal factors (eg, parental obesity and socioeconomic status) are of particular importance.^{8,9} In France, the results of the most recent report show an increase in the prevalence of obesity, affecting 12.4% of the population, including women of childbearing age.¹⁰ Unfortunately, women who are obese or overweight before pregnancy are less likely to initiate breastfeeding.¹¹ They are also more likely to encounter difficulties and breastfeed for shorter durations versus normal-weight women.^{2,11-15} The mechanism by which being overweight or obese negatively affects lactational performance is unknown and likely to be multifactorial in origin. A number of biological factors have been identified. For example, increasing prepregnant BMI has been associated with

delayed lactogenesis,^{12,15} and prepregnant obese or overweight women have a lower prolactin response to suckling early postpartum.¹⁶ This is associated with shortened duration of breastfeeding and may contribute to poor lactational performance in this population.

In women, psychological and behavioral factors are also important but are still poorly defined and understood.¹⁷ The important issue here is whether these kinds of factors affect obese women differentially.¹⁷ We urgently need studies from the women's perspective to help us understand obese women in this situation, their infant-feeding decisions, and behavior.¹⁸ The present study focuses on obese women using a nested case-control design to prospectively compare breastfeeding practices, perceptions, and infant weight change of prepregnant obese women with similar women of normal BMI in the first 3 months postpartum, controlling for maternal confounding factors. To date, no published study has examined this issue from the woman's perspective.¹⁸

PATIENTS AND METHODS

Mothers were identified from the obstetrics database at the Centre Hospitalier Universitaire (CHU) de Poitiers. Between March and October 2005, a total of 1561 women had given birth at the CHU de Poitiers. Of these, 1432 women had known prepregnant height (meters) and weight (kilograms), from which BMI (kilograms per meter squared) was directly calculated. BMI was not available for 129 women. Of the 1432 women with known prepregnant BMI, 141 women (10%) were defined as obese ($\text{BMI} \geq 30 \text{ kg/m}^2$), 227 women (16%) were overweight ($25 \text{ kg/m}^2 \leq \text{BMI} < 30 \text{ kg/m}^2$), 863 women (60%) were normal weight ($18.5 \text{ kg/m}^2 \leq \text{BMI} < 25 \text{ kg/m}^2$), and 201 women (14%) were underweight ($\text{BMI} < 18.5 \text{ kg/m}^2$).¹⁹

All of the French-speaking women who gave birth at the CHU de Poitiers between March and October 2005 with a prepregnant $\text{BMI} \geq 30 \text{ kg/m}^2$ were eligible for the obese group. Control subjects included women giving birth during the same period with a normal prepregnant BMI ($18.5 \text{ kg/m}^2 \leq \text{BMI} < 25 \text{ kg/m}^2$). We excluded births outside of the CHU de Poitiers, mothers whose infants were born at <37 weeks' gestation, twin births, or mothers who could not speak French. For the prospective case-control study, we followed 111 obese mothers, of whom 60 initiated breastfeeding in hospital and the remaining 51 had chosen to formula feed their infants. Obese mothers were matched to 111 normal-weight control subjects ($n = 60$ breastfeeding and $n = 51$ formula feeding) according to the following pairing criteria: initial infant feeding (breast versus formula feeding), maternal country of origin (France versus Africa), parity (primiparous versus multiparous), maternal age (± 5 years), and maternal level of education (none or 1–5, 6–9, 10–12, or >12 years). Maternal and infant characteristics were obtained from medical charts. The protocol was approved by the institutional ethics committee and conducted according to Declaration of Helsinki principles. After receiving a thorough explanation of the study and its purpose, mothers who agreed to participate completed a verbal questionnaire on the ma-

ternity ward. Items in the questionnaire included determinants of their choice of infant feeding, whether the father participated in their choice, and infant-feeding practices (use of formula or breastfeeding) among close family members. Mothers who chose breastfeeding were also asked about how their breastfeeding was going while in the hospital, breastfeeding difficulties, use of silicone nipple protectors, whether they felt uncomfortable breastfeeding in the presence of others, whether they changed positions between feedings, if they anticipated contacting a breastfeeding support organization for follow-up, and infant weight change. Mothers who initiated breastfeeding in the hospital were followed-up by telephone interview at 1 and 3 months. Mothers were asked whether they encountered any breastfeeding difficulties (and, if so, to specify) whether they had switched to mixed feeding (breast milk and formula), perceived their milk supply as adequate, suffered from fatigue, felt uncomfortable breastfeeding in the presence of others, changed positions between feedings, the number of feedings per day and per night, whether they were followed by a breastfeeding support organization or health professional, and infant weight gain at 1 month. Infant weight gain was measured by the pediatrician or physician at the required 1-month visit (and 3-month visit) and was documented in the child's personal health record. Mothers who had discontinued breastfeeding during the first month were asked about the reasons for stopping. Women who were still breastfeeding at 1 month were given the same telephone interview again at 3 months.

Data are presented as means \pm SDs and as proportions (percentages) for continuous and categorical variables, respectively. Differences in means and proportions were tested for significance by using the 2-factor analysis of variance (or Student's *t* test) and the χ^2 test, respectively. Previous data suggests that prepregnant obese women are less likely to initiate or continue breastfeeding and are more likely to encounter difficulties, so comparisons were made without Bonferroni adjustment. For the remaining outcomes, however, we had no such previous information, and a Bonferroni adjustment for multiple comparisons was applied. Statistical analysis was performed by using Statview 5.0 (Abacus Concepts, Berkeley, CA).

RESULTS

In total ($N = 1432$), a smaller proportion, 48.2% (68 of 141), of prepregnant obese mothers initiated breastfeeding versus 64.4% (556 of 863) of mothers with normal prepregnant BMI ($P < .01$). The proportion of mothers initiating breastfeeding was also lower for overweight (129 of 227 [56.8%]; $P < .05$) and underweight women (113 of 201 [56.2%]; $P < .05$) when compared with mothers of the reference weight.

Characteristics of the mothers participating in the study are presented in Table 1. There were no significant differences in all of the pairing criteria of obese compared with reference-weight mothers. The means (\pm SDs) of the prepregnant BMIs for obese versus reference-weight mothers were 33.7 ± 6.7 vs 21.5 ± 2.9

TABLE 1 Characteristics of Reference-Weight and Obese Women Matched for Initial Infant Feeding, Maternal Country of Origin, Parity, Maternal Age, and Level of Education

Characteristic	Reference Weight (N = 111)	Obese (N = 111)
Initial infant feeding, n (%)		
Breastfed	60 (54)	60 (54)
Formula fed	51 (46)	51 (46)
Mother's country of origin, n (%)		
France	108 (97)	108 (97)
Africa	3 (3)	3 (3)
Parity, n (%)		
Primiparous	38 (34)	38 (34)
Multiparous	73 (66)	73 (66)
Maternal age (mean ± SD), y	29.7 ± 9.5	29.4 ± 10.1
Maternal education, n (%)		
None	0 (0)	1 (1)
1–5 y	1 (1)	4 (4)
6–9 y	35 (32)	35 (32)
10–12 y	22 (20)	22 (20)
>12 y	53 (48)	48 (43)

kg/m², respectively. Among all of the participating mothers (111 obese matched with 111 reference weight), the feeding practices of close family members, as well as the father's opinion, influenced the mother's initial choice of infant feeding. For example, 84.3% (75 of 89) of women who chose not to breastfeed came from a family who predominantly practiced formula feeding. Furthermore, 83.1% (98 of 118) of women who chose to breastfeed considered the father's opinion versus only 66.3% (65 of 98) of women who chose formula ($P < .01$). Among women who initially chose formula ($n = 51$ obese matched with $n = 51$ reference weight), decency was the main reason obese mothers chose not to breastfeed (obese: 33.3% [17 of 51] vs reference: 11.8% [6 of 51]; $P < .01$), whereas the main reason reported by reference-weight mothers was the lack of desire to breastfeed (obese: 9.8% [5 of 51] vs reference: 35.3% [18 of 51]; $P < .01$). Other reasons reported for not initiating breastfeeding included bad experience with past breastfeeding, father's choice, easier to formula

feed, fear of pain breastfeeding, use of medications, breast surgery, smoking, and fatigue.

There was a significant main effect of maternal prepregnancy BMI category on pregnancy weight gain (Table 2). Pregnancy weight gain was significantly less in obese versus reference-weight mothers, some of whom (4 of 107 obese) even lost weight during pregnancy. There were no significant effects of maternal prepregnancy BMI category or infant-feeding type on infant birth weight (Table 2). Because selected control subjects may not be fully representative of the entire cohort (because of matching), we recalculated the comparisons on gestational weight gain and birth weight with the entire population of reference-weight mothers. Similarly, we found a lower gestational weight gain in obese (10.0 ± 5.9 kg; $n = 107$) versus reference-weight mothers (14.6 ± 4.7 kg; $n = 772$; $P < .0001$). However, the higher birth weights in infants of obese (3450 ± 469 g; $n = 111$) versus infants of reference-weight mothers (3370 ± 422 g; $n = 815$) approached significance ($P = .0663$). There was a significant interaction between maternal prepregnancy BMI and infant feeding on infant weight loss on the maternity ward and weight gain at 1 month (Table 2). Infants of obese breastfeeding mothers lost more weight on the maternity ward and gained less weight at 1 month compared with infants of reference-weight breastfeeding mothers. However, the difference was only significant for weight gain at 0 to 1 month (Table 2). Furthermore, if we compared breastfed versus formula-fed infants within maternal prepregnant BMI category, a significantly greater weight loss on the maternity ward and lower weight gain at 1 month was observed in breastfed versus formula-fed infants if the mother was obese but not if the mother was of reference weight. By 3 months of age, there were no significant effects on infant weight gain (Table 2). Infant weight change at all of the time points did not differ between obese compared with reference-weight mothers who had initially chosen formula feeding (Table 2).

Among mothers who initiated breastfeeding ($n = 60$ obese women matched with $n = 60$ reference-weight women), infants of obese mothers were less likely to

TABLE 2 Maternal Pregnancy Weight Gain, Infant Birth Weight, and Infant Weight Change According to Type of Infant Feeding and Maternal Prepregnant BMI Category

Variable	Any Breastfeeding		Formula Feeding	
	Reference Weight	Obese	Reference Weight	Obese
Maternal pregnancy weight gain, mean ± SD (n), kg ^a	14.1 ± 4.0 (54)	10.5 ± 5.5 (59)	15.6 ± 4.3 (47)	9.4 ± 6.3 (48)
Infant birth weight, mean ± SD (n), g	3359 ± 411 (60)	3448 ± 520 (60)	3410 ± 401 (51)	3452 ± 404 (51)
Infant weight loss on maternity ward, mean ± SD (n), g ^b	−139 ± 114 (55)	−185 ± 118 (56)	−91 ± 76 (51)	−64 ± 127 (49)
Infant weight gain 0–1 mo, mean ± SD (n), g ^c	1067 ± 422 (48)	818 ± 387 (42)	955 ± 288 (40)	1049 ± 330 (38)
Infant weight gain 0–3 mo, mean ± SD (n), g	2964 ± 904 (38)	2670 ± 1208 (31)	2734 ± 585 (40)	2539 ± 639 (38)

^a P value was $< .0001$, a significant effect of maternal prepregnancy BMI on pregnancy weight gain (2-factor analysis of variance). Lower pregnancy weight gain in obese versus reference-weight mothers (any breastfeeding and formula feeding; $P < .0001$) was significant after Bonferroni correction.

^b P value was $< .05$, a significant interaction between infant feeding and maternal prepregnancy BMI on infant weight loss on the maternity ward (2-factor analysis of variance). Greater weight loss in breastfed infants of obese versus breastfed infants of reference-weight mothers ($P < .05$) was not significant after Bonferroni correction. Greater weight loss in breastfed versus formula-fed infants was significant after Bonferroni correction for obese ($P < .0001$) but not for reference-weight mothers ($P < .05$).

^c P value was $< .01$, a significant interaction between infant feeding and maternal prepregnancy BMI on infant weight gain at 0 to 1 month (2-factor analysis of variance). Lower weight gain in breastfed infants of obese versus breastfed infants of reference-weight mothers ($P < .002$) was significant after Bonferroni correction. Lower weight gain in breastfed versus formula-fed infants of obese mothers only ($P < .01$) was significant after Bonferroni correction.

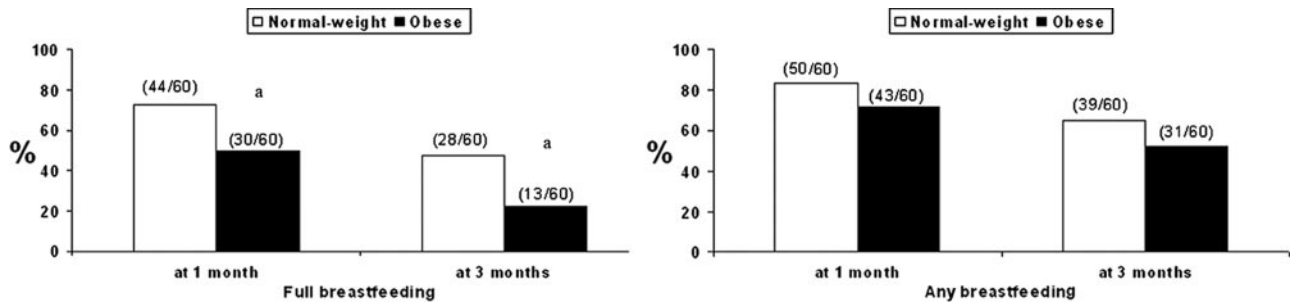


FIGURE 1 Percentage of initially breastfed infants who still received full breastfeeding or any breastfeeding at 1 and 3 months of age according to maternal prepregnant BMI category. Data are significantly different from reference weight within each time point (^a $P < .01$ [χ^2 test]) for full breastfed infants but not for infants breastfed to any extent.

receive full breastfeeding at 1 and 3 months of age versus reference-weight mothers (Fig 1). However, the percentage of infants still receiving any breast milk at 1 and 3 months of age did not differ (Fig 1). While in the hospital, a significantly greater proportion of obese women reported difficulties breastfeeding (eg, cracked nipples, fatigue, or difficulty initiating breastfeeding) versus reference-weight women (Fig 2). Consistent with this, obese women more often reported using silicone nipple protectors (obese: 25.0% [15 of 60] vs reference: 10.0% [6 of 60]; $P < .05$). Moreover, among mothers who continued to breastfeed, obese women more often reported difficulties (cracked nipples, fatigue, or inadequate milk supply) versus reference-weight women at both 1 and 3 months postpartum (Fig 2).

Fewer obese mothers perceived their milk supply as adequate at 1 and 3 months versus reference-weight mothers (Table 3). Moreover, the main reason reported by obese women to stop breastfeeding was inadequate milk supply (16 of 29 [55.2%]) versus only 33.3% (7 of 21) of reference-weight women. Other reasons reported for discontinuing breastfeeding included insufficient infant weight gain, return to work, and fatigue. Obese mothers more often reported feeling uncomfortable breastfeeding in the presence of others compared with reference-weight mothers. However, the difference only reached significance at 3 months but not at 1 month (Table 3) or on the maternity ward (obese: 33.3% [19 of 57] vs reference: 18.3% [11 of 60]; $P = .06$). Obese

mothers were less often followed by health professionals or organizations for breastfeeding support (Table 3). The difference was significant at 3 months only but not at 1 month (Table 3) or on the maternity ward (obese: 18.3% [11 of 60] vs reference: 35.0% [21 of 60]; $P < .05$, not significant after Bonferroni adjustment). No significant differences were reported by obese versus reference-weight women for fatigue, changing positions between feedings, or the number of feedings per day or night (Table 3).

DISCUSSION

It is well known that obese women are less successful at breastfeeding.^{17,18} Here we observed that prepregnant obese women are more likely to give up full but not partial breastfeeding in the first 3 months, and we provide new insights on behavioral and psychological factors that likely contribute to this association. Potential reasons identified in this work include perceived insufficient milk supply, feeling uncomfortable with the idea of breastfeeding in public, and reluctance to seek support for breastfeeding. Of interest as well is the lower gestational weight gain in obese women, the similar birth weight in infants of obese and reference-weight mothers, and the lower infant weight gain from 0 to 1 month in breastfed infants of obese versus reference-weight mothers.

The lower maternal weight gain during pregnancy (although adequate for prepregnant obese women²⁰) may have prevented excessive fetal growth and could explain the similar birth weights in newborns of obese and reference-weight mothers studied here. Lower gestational weight gain in obese versus reference-weight mothers may also have implications for reducing the risk of later childhood overweight. Recent studies have shown that higher gestational weight gain programs child overweight later in life, after controlling for potential confounders.^{21,22} Moreover, in a cohort where many mothers were overweight (mean \pm SD BMI: 24.6 \pm 5.0 kg/m²), pregnancy weight gain within or above the recommended range²⁰ increased the risk of child overweight compared with lower maternal gains during pregnancy.²² In addition to fetal life, early infancy may constitute a critical period for the establishment of obesity. Early postnatal catch-up growth in lighter infants at birth was a risk factor for childhood obesity at 5 years,

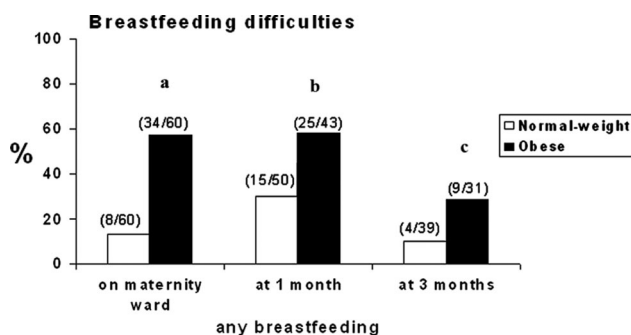


FIGURE 2 Percentage of breastfeeding mothers who reported breastfeeding difficulties on the maternity ward and at 1 and 3 months postpartum according to maternal prepregnant BMI category. Data are significantly different from reference weight within each time point (χ^2 test: ^a $P < .05$; ^b $P < .01$; ^c $P < .0001$).

TABLE 3 Breastfeeding Practices and Perceptions of Mothers Maintaining Any Breastfeeding at 1 and 3 Months Postpartum According to Maternal Prepregnant BMI Category

Variable	At 1 mo		At 3 mo	
	Reference Weight (n = 50)	Obese (n = 43)	Reference Weight (n = 39)	Obese (n = 31)
Adequate breast milk supply, n (%)	47 (94)	26 (60) ^a	36 (92)	17 (55) ^b
Uncomfortable breastfeeding in the presence of others, n (%)	13 (26)	20 (47) ^c	5 (13)	13 (42) ^d
Followed by a breastfeeding support organization or health professional, n (%)	14 (28)	4 (9) ^c	15 (39)	3 (10) ^d
Fatigue, n (%)	22 (44)	27 (63)	9 (23)	15 (48) ^e
Changing positions between feedings, n (%)	41 (82)	36 (84)	35 (90)	22 (71) ^e
No. of feedings per day, mean ± SD	5.7 ± 1.2	5.8 ± 1.1	5.2 ± 1.0	5.1 ± 1.3
No. of feedings per night, mean ± SD	1.6 ± 1.0	1.9 ± 0.9	0.4 ± 0.8	0.5 ± 0.7

^a P value was <.0001, obese versus reference weight at 1 month by χ^2 test, which was significantly different after Bonferroni correction.

^b P value was <.001, obese versus reference weight at 3 months by χ^2 test, which was significantly different after Bonferroni correction.

^c P value was <.05, obese versus reference weight at 1 month by χ^2 test, which was not significantly different after Bonferroni correction.

^d P value was <.01, obese versus reference weight at 3 months by χ^2 test, which was significantly different after Bonferroni correction.

^e P value was <.05, obese versus reference weight at 3 months by χ^2 test, which was not significantly different after Bonferroni correction.

whereas catch-down growth in infants of large birth weight was related to thin size at 5 years.²³ Moreover, rapid weight gain during early infancy has been associated with increased risk of childhood overweight, independent of birth weight.²⁴ The potential implications of the lower weight gain in breastfed infants of obese versus reference-weight mothers on reducing the child's risk of later obesity requires additional study. However, our observation highlights the need to reevaluate the child growth standards for breastfed infants born to obese mothers.

Decency was the main reason reported by obese women for not initiating breastfeeding. The feeding practices of close family members, as well as the father's opinion, also influenced the mother's initial choice of infant feeding. Exposure to breastfeeding role models has been shown to influence a mother's decision to breastfeed, and support by the father can assist the mother during breastfeeding initiation.^{1,25} Among mothers who initiated breastfeeding, obese mothers were not more likely to stop breastfeeding overall, despite increased difficulties. Breastfeeding difficulties at ≤ 4 weeks is a risk factor for early cessation of full or any breastfeeding.^{26,27} Importantly, we observed that obese breastfeeding mothers were, however, less likely to seek support for breastfeeding in the first 3 months. It is possible that obese mothers who maintain any breastfeeding represent a strongly motivated group, because women who experience difficulties during the first week but continue to breastfeed may develop greater self-efficacy.²⁶

In line with obese mothers' perception of an inadequate milk supply, obese mothers were less likely to maintain full breastfeeding at 1 and 3 months. This is of concern, because the health benefits of breastfeeding are often linked to its duration and exclusivity.^{1,5} The lower weight gain in breastfed infants of obese mothers could partly contribute to obese mothers' perception of inadequate breast milk. Previous work has shown that excess infant weight loss is associated with maternal BMI >27 and delayed onset of milk production.²⁸ On the other hand, nearly all women with delayed onset of lactation can eventually establish an adequate milk supply, with appropriate guidance.²⁸

Our study had several strengths. The case-control design permitted us to use a smaller sample size and to carry out the study in a single facility. We explicitly defined the criteria for the diagnosis of obesity and the eligibility criteria used for selection. Furthermore, reference-weight women came from the same population as the obese women. Although a problem with the case-control study is confounding, we addressed this issue in the design stage by matching for important maternal factors, thus enhancing the validity of our results. Although case-control studies are prone to retrospective bias, we reduced potential recall bias by using a prospective case-control design nested within a larger cohort. Although it was impossible for data gatherers to be blinded to the case-control status of our participants, we used a standard questionnaire to elicit exposure to the factors of interest in a similar manner between obese and reference-weight women.

Among limitations, this type of study cannot prove causation. Here we identify potential reasons why obese mothers give up breastfeeding sooner. We must also consider that other factors (not studied here) likely contribute to this association and how they might interact with the factors in question, of which additional study is warranted. Moreover, the design did not permit us to give an estimate of the absolute risk of the factors in question. For that information, we would need to consult data from outside the study.

CONCLUSIONS

Pediatricians need to be aware that obese women represent a high-risk group, because they are less likely to initiate and continue breastfeeding according to current infant-feeding recommendations. We have identified a number of psychological and behavioral factors likely to be important determinants of the duration of breastfeeding in obese women. For the pediatrician, these factors merit attention, because they represent possible targets for interventions to improve breastfeeding success in obese. Among possible interventions, pediatricians could target obese women for additional education and assis-

tance for breastfeeding early postpartum with special attention to the factors identified in this work. Of interest as well to the pediatrician is the lower infant weight gain in breastfed infants of obese versus reference-weight mothers. This warrants consideration in the assessment and monitoring of child growth during early infancy and when counseling obese breastfeeding mothers. A better understanding of breastfeeding practices and perceptions of obese mothers may also facilitate the development of more effective breastfeeding promotion interventions targeted at obese women, especially because it has been shown that breastfeeding promotion interventions and infant friendly hospital initiatives can increase both the duration and exclusivity of breastfeeding in the first year of life.^{29,30} Any potential promotion interventions, however, need to be tested using a randomized, controlled trial in this population.

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REFERENCES

- Gartner LM, Morton J, Lawrence RA, et al. Breastfeeding and the use of human milk. *Pediatrics*. 2005;115(2):496–506
- Baker JL, Michaelsen KF, Rasmussen KM, Sorensen TI. Maternal prepregnant body mass index, duration of breastfeeding, and timing of complementary food introduction are associated with infant weight gain. *Am J Clin Nutr*. 2004;80(6):1579–1588
- Dewey KG. Is breastfeeding protective against child obesity? *J Hum Lact*. 2003;19(1):9–18
- Grummer-Strawn LM, Mei Z. Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. *Pediatrics*. 2004;113(2). Available at: www.pediatrics.org/cgi/content/full/113/2/e81
- Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. *Pediatrics*. 2005;115(5):1367–1377
- von Kries R, Koletzko B, Sauerwald T, et al. Breast feeding and obesity: cross sectional study. *BMJ*. 1999;319(7203):147–150
- Li C, Kaur H, Choi WS, et al. Additive interactions of maternal prepregnancy BMI and breast-feeding on childhood overweight. *Obes Res*. 2005;13(2):362–371
- Owen CG, Martin RM, Whincup PH, et al. The effect of breastfeeding on mean body mass index throughout life: a quantitative review of published and unpublished observational evidence. *Am J Clin Nutr*. 2005;82(6):1298–1307
- Reilly JJ, Armstrong J, Dorosty AR, et al. Early life risk factors for obesity in childhood: cohort study. *BMJ*. 2005;330(7504):1357
- ObEpi. *Enquête Épidémiologique Nationale sur le Surpoids et L'obésité*. Paris, France: INSERM/TNS Healthcare SOFRES/Roche; 2006
- Li R, Jewell S, Grummer-Strawn L. Maternal obesity and breast-feeding practices. *Am J Clin Nutr*. 2003;77(4):931–936
- Hilson JA, Rasmussen KM, Kjolhede CL. High prepregnant body mass index is associated with poor lactation outcomes among white, rural women independent of psychosocial and demographic correlates. *J Hum Lact*. 2004;20(1):18–29
- Donath SM, Amir LH. Does maternal obesity adversely affect breastfeeding initiation and duration? *J Paediatr Child Health*. 2000;36(5):482–486
- Rutishauser IH, Carlin JB. Body mass index and duration of breast feeding: a survival analysis during the first six months of life. *J Epidemiol Community Health*. 1992;46(6):559–565
- Hilson JA, Rasmussen KM, Kjolhede CL. Maternal obesity and breast-feeding success in a rural population of white women. *Am J Clin Nutr*. 1997;66(6):1371–1378
- Rasmussen KM, Kjolhede CL. Prepregnant overweight and obesity diminish the prolactin response to suckling in the first week postpartum. *Pediatrics*. 2004;113(5). Available at: www.pediatrics.org/cgi/content/full/113/5/e465
- Rasmussen KM. Association of maternal obesity before conception with poor lactation performance. *Annu Rev Nutr*. 2007;27:103–121
- Amir LH, Donath S. A systematic review of maternal obesity and breastfeeding intention, initiation and duration. *BMC Pregnancy Childbirth*. 2007;7:9
- World Health Organization. *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*. Geneva, Switzerland: World Health Organization; 2000
- Institute of Medicine. *Nutrition During Pregnancy*. Washington, DC: National Academy Press; 1990
- Moreira P, Padez C, Mourao-Carvalho I, Rosado V. Maternal weight gain during pregnancy and overweight in Portuguese children. *Int J Obes (Lond)*. 2007;31(4):608–614
- Oken E, Taveras EM, Kleinman KP, Rich-Edwards JW, Gillman MW. Gestational weight gain and child adiposity at age 3 years. *Am J Obstet Gynecol*. 2007;196(4):322 e1–e8
- Ong KK, Ahmed ML, Emmett PM, Preece MA, Dunger DB. Association between postnatal catch-up growth and obesity in childhood: prospective cohort study. *BMJ*. 2000;320(7240):967–971
- Stettler N, Zemel BS, Kumanyika S, Stallings VA. Infant weight gain and childhood overweight status in a multicenter, cohort study. *Pediatrics*. 2002;109(2):194–199
- Kessler LA, Gielen AC, Diener-West M, Paige DM. The effect of a woman's significant other on her breastfeeding decision. *J Hum Lact*. 1995;11(2):103–109
- DiGirolamo A, Thompson N, Martorell R, Fein S, Grummer-Strawn L. Intention or experience? Predictors of continued breastfeeding. *Health Educ Behav*. 2005;32(2):208–226
- Scott JA, Binns CW, Oddy WH, Graham KI. Predictors of breastfeeding duration: evidence from a cohort study. *Pediatrics*. 2006;117(4). Available at: www.pediatrics.org/cgi/content/full/117/4/e646
- Dewey KG, Nommsen-Rivers LA, Heinig MJ, Cohen RJ. Risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss. *Pediatrics*. 2003;112(3 pt 1):607–619
- Kramer MS, Chalmers B, Hodnett ED, et al. Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus. *JAMA*. 2001;285(4):413–420
- Merten S, Dratva J, Ackermann-Liebrich U. Do baby-friendly hospitals influence breastfeeding duration on a national level? *Pediatrics*. 2005;116(5). Available at: www.pediatrics.org/cgi/content/full/116/5/e702

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