Telephone-based support prolongs breastfeeding duration in obese women: a randomized trial

Emma Malchau Carlsen, Anne Kyhnaeb, Kristina M Renault, Dina Cortes, Kim F Michaelsen, and Ole Pryds

ABSTRACT

Background: Obese women often have difficulties breastfeeding.

Objective: We evaluated whether telephone-based support could increase the duration of breastfeeding in obese women and, thereby, reduce offspring growth.

Design: We recruited 226 dyads of obese mothers and their singleton, healthy, term infants. The women were randomly assigned to 6 mo of breastfeeding support or standard care controls. At 6 mo, there were 207 dyads in the study; 105 dyads received support, and 102 dyads were control subjects. One International Board Certified Lactation Consultant carried out the intervention, which was based on structured interviews and consisted of encouraging telephone calls.

Results: The support group breastfed exclusively for a median of 120 d (25th–75th percentiles: 14–142 d) compared with 41 d (3–133 d) for control subjects (P = 0.003). Any breastfeeding was maintained for a median of 184 d (92–185 d) for the support group compared with 108 d (16–185 d) for control subjects (P = 0.002). Support increased the adjusted ORs for exclusive breastfeeding at 12 mo (OR: 2.61; 95% CI: 1.88, 3.65; P = 0.002) and 18 mo (OR: 2.46; 95% CI: 1.69, 3.58; P = 0.001), respectively. The duration of exclusive breastfeeding was inversely associated with infant weight (β = −4.39 g/d; 95% CI: −6.94 to −1.84; P < 0.001) and infant length at 6 mo (β = −0.01 cm/d; 95% CI: −0.02 to 0.01; P = 0.05), the breastfeeding support did not achieve a significant effect on infant growth at 6 mo (β = 0.001).

Conclusions: Telephone-based advisory support was very effective in prolonging breastfeeding in obese mothers who often terminate the breastfeeding of their infants prematurely. A longer duration of breastfeeding may decrease risk of noncommunicable diseases in these infants. This trial was registered at clinicaltrials.gov as NCT01235663. Am J Clin Nutr 2013;98:1226–32.

INTRODUCTION

Obese women meet obstacles in initiating and maintaining breastfeeding, both exclusively and partially (1–4). The establishment and success of breastfeeding depend on many factors of both biological and psychological origin. Obese women may have a lower prolactin response to suckling that leads to diminished milk production and a premature cessation of breastfeeding (5). Obese women also experience mechanical difficulties when positioning the baby and latching on (6). Psychological factors such as low self-confidence and a lack of breastfeeding experience also contribute to an unsuccessful course (7, 8).

Offspring of obese mothers have higher risk of obesity during childhood and as adults (9, 10). Furthermore, infants with high growth rates or early obesity have increased risk of developing metabolic syndrome with insulin resistance and cardiovascular disease (11, 12). There are many health benefits associated with breastfeeding, and prolonged nursing may reduce risk of subsequent obesity during infancy and adulthood (13–15). The Promotion of Breastfeeding Intervention Trial (PROBIT) study from 2008 investigated the effect of a breastfeeding intervention on adiposity at 6.5 y of age, and no protective effect of breastfeeding was shown. However, this study was performed in a setting with a low prevalence of obesity, and only women with successful breastfeeding initiation were included (16).

Breastfeeding promotion has been shown to elevate breastfeeding rates in previous studies. The following different interventions were used: peer counseling, community campaigns, and telephone-based interventions (17–19). To our knowledge, there have been only 3 studies that evaluated a breastfeeding intervention in cohorts of obese women. Peer counseling (20) and telephone-based support and breast-milk expression were assessed (21), but neither study showed any effect on breastfeeding rates at 3 and 6 mo postpartum.

We hypothesized that telephone support could extend the exclusive and partial breastfeeding duration in obese women. Second, we wanted to evaluate if breastfeeding intervention affects infant 6-mo anthropometric measurements in this high-risk cohort.

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4 Abbreviations used: GWG, gestational weight gain; PROBIT, Promotion of Breastfeeding Intervention Trial; TOP-study, Treatment of Obese Pregnant study.

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SUBJECTS AND METHODS

Intervention

The breastfeeding promotion was designed as a telephone-based advisory support service, which was performed by a certified lactation consultant (International Board Certified Lactation Consultant). The aim of the intervention was to prolong the duration of exclusive and partial breastfeeding. All contacts followed a structured design posing questions of physical and psychological aspects related to breastfeeding and the well-being of the mother and child (Table 1). During the conversation, it was determined whether the mother had sufficient knowledge of breastfeeding, and advice was provided if necessary. Any difficulties were discussed, and possible solutions were identified. It was registered whether breastfeeding was exclusive or partial. The termination of breastfeeding was registered as well as the date of the introduction of other nutritional supplements apart from vitamin D, an iron supplement, and water. The first contact was set to last ~20 min, whereas the duration of the following calls was between 5–10 min.

The initial contact was made within the first week. All participants were offered a minimum of 9 consultations during the first 6 mo provided that the mothers breastfed during the entire period. Three contacts were made during the first month, and thereafter, participants were contacted every second week until 8 wk postpartum and, thereafter, once monthly. Extra contacts were offered for specific difficulties, whereas support was stopped when breastfeeding was terminated. All women had the direct telephone number to the lactation consultant, and she was available 7 d/wk. Breastfeeding data were collected by telephone. At the age of 6 mo, all infants underwent a clinical examination.

Exclusive breastfeeding was defined according to the WHO criteria of breastfeeding only supplemented with vitamins, mineral supplements, and water (22). Partial breastfeeding was defined as breastfeeding supplemented with formula milk or solid food.

The Danish National Board of Health recommends exclusive breastfeeding for 6 mo and partial breastfeeding up to 12 mo (23). In accordance with Danish standards, all participants had contact with a health visitor or a midwife within the first week after birth. A health visitor is a pediatric nurse who makes home visits during the first 18 mo of the child’s life. These visits are performed to examine the wellbeing of the baby and to support breastfeeding. In addition, all women in the control group were offered standard breastfeeding support at Hvidovre Hospital. The hospital is not a certified Baby Friendly Hospital but encourages and supports breastfeeding. Our lactation consultant did not actively influence any recommendations from the midwife, health visitor, or general practitioner during routine follow-ups. Before the start of the trial, all health visitors were informed about the study. In Denmark, all women are entitled to a 52-wk maternity leave. The intervention was blinded to the study staff, which collected data on breastfeeding status and infant growth. The lactation consultant was not involved in measuring infants.

Subjects

We consecutively recruited singleton, healthy infants born at term (>258 d of gestation) with a postnatal age <48 h. Women who intended to breastfeed and who had no history of breast surgery were included. Participants were recruited between 10 December 2010 and 30 June 2012. All mothers had participated in the Treatment of Obese Pregnant study (TOP-study) at Hvidovre Hospital, Copenhagen University. The TOP-study inclusion criterion was a prepregnancy BMI (in kg/m2) ≥30, and the aim was to minimize weight gain during pregnancy (aim: gestational weight gain <5 kg). Mothers were randomly assigned to 1) exercise and diet, 2) exercise alone, or 3) a control. The TOP-study included 425 women. The current study was initiated 1 y and 7 mo after the TOP-study had started inclusion and when 155 women had already completed the study period. Therefore, not all TOP-study participants were eligible for inclusion in our breastfeeding intervention.

Sick infants who required admission to a neonatal intensive care unit or who were suffering from congenital disease or malformations were excluded.

Random assignment

Mother-newborn dyads were allocated (1:1) to the intervention by telephone support or control standard care by using a web-based independent program. Participants were consecutively included without deference to maternal TOP-study random assignment.

We aimed to invite 240 mother-newborns dyads to ensure that 200 dyads completed the study period of 6 mo. The expected dropout rate was set to 20%. The number of 200 dyads was derived from a power calculation ($\alpha = 0.05; \beta = 0.20$) on the basis of a 15% increase in the exclusive breastfeeding rate. We aimed to achieve a rate of exclusive breastfeeding of 25% 6 mo after delivery, which is the rate in the general Danish population [data from the Danish Health and Medicines Authority (23)]. Post hoc, we calculated the sample size to detect a difference (±SD) in the weight $z$ score of 0.1 ± 1; a total of 1570 dyads should have been included ($\alpha = 0.05; \beta = 0.20$).

Infant anthropometric measurement

Recumbent infant weight (Seca 727 digital baby scales; seca), length, and head circumference were measured by using a non-stretchable measuring tape according to WHO guidelines. Abdominal circumference was measured with the subject lying supine on the nonstretchable measuring tape during midexpiration at the umbilical level. In addition, at 6 mo, triceps and subscapular skinfold thicknesses were measured by using a Harpendens skinfold caliper (Harpendens Calipers). Length

<table>
<thead>
<tr>
<th>Questions from the lactation consultant to the mother</th>
</tr>
</thead>
<tbody>
<tr>
<td>How are you doing?</td>
</tr>
<tr>
<td>How much milk do you have?</td>
</tr>
<tr>
<td>How many times a day do you breastfeed?</td>
</tr>
<tr>
<td>How long does each breastfeeding session last?</td>
</tr>
<tr>
<td>How is your baby doing?</td>
</tr>
<tr>
<td>Has your baby gained weight?</td>
</tr>
<tr>
<td>Are you in pain when breastfeeding?</td>
</tr>
<tr>
<td>Does your network support breastfeeding?</td>
</tr>
<tr>
<td>Do you feel uncomfortable breastfeeding around others or in public?</td>
</tr>
<tr>
<td>For how long do you intend to breastfeed?</td>
</tr>
</tbody>
</table>

1 Asked only at the first contact.
was measured by using a wooden infantometer with a sliding footrest. All measures were taken in triplicates, and the mean was used in the analysis (apart from weight, which was measured once), by experienced study staff. Newborn anthropometric measurements were collected from the birth chart, which had been filled in by the midwife.

Maternal data
Information on maternal social and smoking status, exercise habits, and previous pregnancies was self-reported in a questionnaire filled in during the first trimester. The gestation length was determined by an early ultrasound examination at the Department of Obstetrics.

Prepregnancy weight was self-reported. All women were weighed at the hospital at 36–37 wk gestation in light clothing without shoes according to TOP-study protocol (Seca digital scales; seca). Prepregnancy BMI was calculated as weight over height squared. Maternal gestational weight gain (GWG) was calculated from the difference between the weight at 36–37 wk gestation and the self-reported prepregnancy weight.

Codes for maternal intervention during pregnancy were revealed after completing the TOP-study to evaluate if the maternal diet or physical activity intervention affected the duration of breastfeeding and infant growth, respectively.

Ethics
The Ethics Committee of the Capital Region of Denmark (H-D-2008-119) approved the study, and written informed consent was obtained from both parents before infants were included. This trial was registered at clinicaltrials.gov as NCT01235663.

Statistical analysis

Descriptive statistics, means, and SDs were calculated for all outcome variables. These variables were compared between telephone support compared with standard care to disclose any differences in maternal and infant variables. For normally distributed data, independent Student’s t tests were calculated. The Mann-Whitney U test was used to compare medians for non-normally distributed data. Fisher’s exact and chi-square tests were used to analyze any differences between proportions. Binary logistic regression was used to calculate crude and adjusted ORs and 95% CIs for breastfeeding in relation to random assignment at 3 d, 7 d, 4 wk, and 3 mo after birth \(^1\) for exclusive breastfeeding and \(^2\) at 6 mo after birth for partial breastfeeding. The following variables with a \( P < 0.25 \) in the univariate analysis were forced into the logistic regression: birth weight, gestational age, parity, and sex as well as factors with a likely biological impact (GWG and prepregnancy BMI). Categorical predictor variables relating to exercise and diet were incorporated for TOP-study assignment.

A Kaplan-Meier plot was made to illustrate the time to cessation of both exclusive and any breastfeeding by comparing the intervention group to controls. Cox regression was used to statistically test the duration of exclusive and any breastfeeding in the intervention group compared with the control group. If the woman was still breastfeeding at 6 mo, the case was censored, which meant that no event occurred. An event was defined as the cessation of exclusive or any breastfeeding.

Descriptive statistics for infant anthropometric measurements at 6 mo were calculated. The telephone-support group was compared with the standard care group by using an independent Student’s t test. The estimated birth weight, adjusted for gestational age and sex, was calculated according to Marsål et al (24).
Infant gestational age, days of partial breastfeeding, age at the 6-mo examination, and age when complementary feeding was introduced. Two women in the intervention group had stopped breastfeeding before the initial contact was made, but both women were still included in the analysis. Women in the intervention group maintained exclusive breastfeeding for a median of 79 d \((P = 0.003)\) and any breastfeeding for a median of 76 d \((P = 0.002)\) longer than did control subjects \((Table 3)\).

Courses of exclusive and any breastfeeding in the 2 groups are illustrated in \(Figures 2\) and \(3\) and show an overall improved breastfeeding rate in the intervention group for both exclusive \((P = 0.032)\) and partial breastfeeding \((P = 0.02)\). The support group had significantly higher exclusive and partial breastfeeding rates, both crude and adjusted ORs \((Table 4)\). There was no effect of TOP-study random assignment \(\text{(diet and exercise)}\) on the duration of exclusive breastfeeding \((P = 0.84)\) or partial breastfeeding \((P = 0.59)\).

Breastfeeding and growth

The intervention did not cause significant differences in infant anthropometric measurements at 6 mo \((Table 5)\). Mean infant weights at 6 mo were similar in intervention and control groups.

**RESULTS**

**Inclusion**

The planned number of 240 dyads was not reached before termination of the TOP-study. Two hundred forty-four mother-infant dyads were eligible for inclusion, and 226 dyads \((93\% \text{ of those invited})\) accepted. Of the 18 dyads who declined participation, 10 dyads had already decided not to breastfeed, and another 8 dyads did not want to participate because of a sufficient a priori breastfeeding experience \((Figure 1)\).

One-hundred-and-eight dyads were randomly assigned to breastfeeding support, and 118 dyads received standard care and served as control subjects. Data on breastfeeding were collected in 97\% \((105 \text{ of } 108)\) of the intervention group and in 86\% \((102 \text{ of } 118)\) in the control group \((P = 0.01)\). Anthropometric measures at 6 mo were obtained in 83\% of infants \((90 \text{ of } 108)\) from the intervention group and 86\% of control subjects \((102 \text{ of } 118)\) \((P = 0.53)\).

**Breastfeeding support: duration of breastfeeding**

There were no differences in baseline characteristics regarding maternal and infant data between the 2 groups \((Table 2)\). Women in the support group received a mean \(\pm \text{SD}\) of 6.9 \(\pm 2.5\) telephone calls \(\text{(median: 8 calls; range: 1–9 calls)}\). Extra calls were given in 37 cases \(\text{(mean } \pm \text{SD: 1.6 } \pm 0.87 \text{ calls; median 1 call; range: 1–4 calls)}\). Only 5 persons contacted the lactation consultant \(\text{(one time by 3 subjects and 2 times by 2 subjects)}\).

Two women in the intervention group had stopped breastfeeding before the initial contact was made, but both women were still included in the analysis. Women in the intervention group maintained exclusive breastfeeding for a median of 79 d \((P = 0.003)\) and any breastfeeding for a median of 76 d \((P = 0.002)\) longer than did control subjects \((Table 3)\).

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**Breastfeeding and growth**

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**TABLE 2**

<table>
<thead>
<tr>
<th>Subject characteristics</th>
<th>Supported</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (y)</td>
<td>31.3 (\pm 4.5)</td>
<td>31.8 (\pm 4.1)</td>
</tr>
<tr>
<td>Prepregnancy BMI (kg/m²)</td>
<td>32.5 (30.0–50.3)</td>
<td>32.8 (30.0–45.6)</td>
</tr>
<tr>
<td>Gestational weight gain (kg)</td>
<td>9.2 (\pm 12.1)</td>
<td>10.2 (\pm 6.0)</td>
</tr>
<tr>
<td>Parity</td>
<td>1 (1–4)</td>
<td>1 (1–2)</td>
</tr>
<tr>
<td>Primiparous (%)</td>
<td>67</td>
<td>54</td>
</tr>
<tr>
<td>Maternal education (y)</td>
<td>14.3 (\pm 2.3)</td>
<td>14.0 (\pm 2.2)</td>
</tr>
</tbody>
</table>

\(^{1}\text{Mean } \pm \text{ SD (all such values). Student’s } t\text{ test was used for analysis; there were no significant differences.}\)

\(^{2}\text{Median; range in parentheses (all such values). Mann-Whitney test was used for analysis; there were no significant differences.}\)

\(^{3}\text{Chi-square test was used for analysis; there were no significant differences.}\)

\(^{4}\text{TOP-study, Treatment of Obese Pregnant study.}\)

Distances between the actual and the estimated birth weight are presented as \(z\) scores. Weight, length, and weight/height for age and sex at 6 mo were calculated by using WHO growth standards \((25)\), and both crude and adjusted \(z\) scores were calculated.

Multiple linear regressions with weight and length at 6 mo as dependent variables \(\text{(one model for weight and one for length)}\) were used to evaluate the effect of breastfeeding \(\text{(exclusive and partial)}\) after adjustment for maternal age, maternal parity, maternal education, maternal smoking, maternal prepregnancy BMI, GWG, TOP-study random assignment, breastfeeding-intervention random assignment, infant sex, infant birth weight, infant gestational age, days of partial breastfeeding, age at the 6-mo examination, and age when complementary feeding was introduced.

The significance level was set at 0.05 for all analyses. SPSS software was used \(\text{(IBM SPSS statistics, version 19).}\)
weight. Control groups were compared (data not shown).

Partial breastfeeding and weight at the 6-mo examination, and age at introduction of complementary feeding were inversely related to weight \( (b = -4.39 \text{ g/d}; 95\% \text{ CI: } -8.11 \text{ g/d}; P = 0.021) \) and length \( (b = -0.012 \text{ cm/d}; 95\% \text{ CI: } -0.016 \text{ cm/d}; P = 0.004) \) at 6 mo after adjustment for maternal age, maternal parity, maternal education, maternal smoking, maternal prepregnant BMI, GWG, TOP-study random assignment, infant sex, birth weight, infant gestational age, days of partial breastfeeding, age at the 6-mo examination, and age at introduction of complementary feeding. There was no association between days of partial breastfeeding and weight \( (P = 0.23) \) or length \( (P = 0.09) \) at 6 mo.

**DISCUSSION**

This study showed a marked effect of breastfeeding intervention in obese women. Telephone-based support increased the duration of both exclusive and partial breastfeeding rates considerably during the first 6 mo postpartum. For supported women, the median duration of exclusive or any breastfeeding was prolonged for 79 and 76 d, respectively. Previous studies with the aim of prolonging breastfeeding in obese women have been inconclusive (20, 21). To our knowledge, our study is the first to find a substantial effect, which indicated that, although breastfeeding in obese women is problematic, it is possible to intervene and, thereby, get a better outcome.

Children of obese mothers have an increased risk of obesity and subsequently higher risk of developing metabolic syndrome. Observational studies have shown that breastfed infants grow slower and are leaner than formula-fed infants, and consequently, prolonged breastfeeding may protect against obesity and later insulin resistance and cardiovascular disease (9–15, 26, 27). We showed that weight and length at 6 mo decreased with the duration of exclusive breastfeeding, as anticipated. The relation between the duration of exclusive breastfeeding and infant size at 6 mo in our study emphasized the importance of breastfeeding in offspring of obese women.

However, no statistical difference was shown when infant anthropometric measures at 6 mo were analyzed with regard to the intervention. Our study was not powered for this difference, and a potential bias should be considered. All women were recruited from the TOP-study; the women were highly motivated and had paid attention to lifestyle-related issues, which led to a higher awareness regarding offspring growth, adiposity, and breastfeeding. These factors might have affected the secondary outcome in our study. The PROBIT study showed no effect of breastfeeding intervention on adiposity at 6.5 y. When these results are extrapolated to other settings, the low prevalence of maternal obesity in the PROBIT cohort should be taken into account (16).

There was an early effect of our breastfeeding support, which was already significant at 3 d postpartum. The lactation consultant had not contacted all women at that time, but participants were informed of the random assignment result. Because study participants knew that they would be approached might have increased their commitment and helped them to overcome obstacles related to breastfeeding. All women were given the lactation consultant’s telephone number, and they had the opportunity to call her within the first days if they encountered problems, although very few subjects made use of this possibility. The early effect of our intervention may have been because of a Hawthorne effect, although this phenomenon has been heavily debated (28, 29).

Despite an intensive intervention, a considerable proportion of women (15% in total) were unable to establish sufficient partial breastfeeding and an even-higher proportion did not establish exclusive breastfeeding. In some cases, exclusive breastfeeding was terminated during the first days after birth. Previous studies by Chapman et al (20) and Rasmussen et al (21) have supported this observation, which may indicate the inappropriate guidance of these women or a true physiologic difference that made them incapable of breastfeeding (20, 21). Additional research is needed to reveal the pathogenesis behind the obstacles obese women...
encounter in breastfeeding. Improved knowledge of all factors involved in breastfeeding establishment may imply more sophisticated breastfeeding interventions in the future.

Our randomized intervention was telephone based, and one lactation consultant performed all calls. At times, the setup was logistically challenging for the consultant, but the approach ensured uniformity in interviews and recommendations. The intervention was of higher intensity during the establishment of breastfeeding, and the nurse focused on both psychological and biological problems related to the establishment and maintenance of breastfeeding (1–4). Our intervention was designed to be of fairly low cost, followed a fixed structure, and was of minimal effort for participants and, thus, was telephone based. The cost of the consultant was based on an approximation that each participant would take \(~90 \text{ min}\) throughout the study period of 6 mo. Therefore, we showed that the intervention was feasible for implementation in clinical practice.

Our study participants constituted a homogenous group, which reduced risk of additional bias but also lowered the external validity of our results. Compared with previous breastfeeding-intervention studies in obese women, the average maternal age in our cohort was higher (20, 21). In addition, all women were quite well educated, and both factors contributed to a better breastfeeding outcome (30, 31). Primiparity has a negative influence on breastfeeding success. The high proportion of primiparous women in our study may have impaired the number of women who succeeded in establishing breastfeeding (4, 32). An initial and more intensive support program may be important to establish breastfeeding in the primiparous obese mother. In contrast to previous reports, our intervention was effective in sustaining breastfeeding in obese women-infant dyads \(\leq6\) mo of age (20, 21). Our intervention was successful because a total of 65% in the intervention and 48% in the control group were still breastfeeding 4 mo after birth. However, these numbers were lower than the 85% detailed in the Danish National registers (23). The difference shows that obese women are at higher risk of early termination of breastfeeding, and larger studies that target breastfeeding in obese mothers may be useful to determine the full potential of our intervention. The possible growth-related advantages related to breastfeeding could also be further explored.

In conclusion, a telephone-based intervention by a lactation consultant prolongs exclusive and partial breastfeeding in obese women during the first 6 mo postpartum. The intervention is of fairly low cost and easy to implement. Studies that target pathophysiologic factors related to breastfeeding establishment in obese women are needed to design more appropriate interventions. The duration of exclusive breastfeeding was inversely associated to infant weight and length at 6 mo of age. Thus, it is likely that a pronounced prolongation of breastfeeding in obese mothers may reduce infant weight gain and, thereby, risk of later obesity and metabolic complications.

### Table 4

<table>
<thead>
<tr>
<th>Breastfeeding</th>
<th>Crude</th>
<th>(P)</th>
<th>Adjusted(^2)</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 d after birth</td>
<td>5.36 (2.09, 13.71)</td>
<td>&lt;0.001</td>
<td>5.99 (2.27, 15.87)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>7 d after birth</td>
<td>2.80 (1.48, 5.30)</td>
<td>0.002</td>
<td>3.15 (1.60, 6.23)</td>
<td>0.001</td>
</tr>
<tr>
<td>2 wk after birth</td>
<td>2.40 (1.30, 4.41)</td>
<td>0.005</td>
<td>2.71 (1.43, 5.12)</td>
<td>0.002</td>
</tr>
<tr>
<td>4 wk after birth</td>
<td>2.52 (1.41, 4.49)</td>
<td>0.002</td>
<td>2.98 (1.61, 5.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3 mo after birth</td>
<td>2.14 (1.23, 3.74)</td>
<td>0.007</td>
<td>2.45 (1.36, 4.41)</td>
<td>0.003</td>
</tr>
<tr>
<td>Partial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mo after birth</td>
<td>1.85 (1.06, 3.21)</td>
<td>0.03</td>
<td>2.25 (1.24, 4.08)</td>
<td>0.008</td>
</tr>
</tbody>
</table>

\(^1\) \(P\) values were determined by using logistic regression.

\(^2\) Adjusted for prepregnancy BMI, gestational weight gain, parity, birth weight, gestational age, and infant sex.

### Table 5

<table>
<thead>
<tr>
<th>Infant anthropometric measurements</th>
<th>Treatment group, crude</th>
<th>Treatment group, adjusted(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ((n))</td>
<td>Supported (90)</td>
<td>Control (102)</td>
</tr>
<tr>
<td>(z) score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.10 ± 1.32</td>
<td>0.23 ± 1.02</td>
</tr>
<tr>
<td>Weight at 6 mo</td>
<td>0.56 ± 0.94</td>
<td>0.66 ± 0.96</td>
</tr>
<tr>
<td>Length at 6 mo</td>
<td>0.78 ± 0.91</td>
<td>0.87 ± 0.98</td>
</tr>
<tr>
<td>Weight/height at 6 mo</td>
<td>0.26 ± 1.02</td>
<td>0.33 ± 1.00</td>
</tr>
<tr>
<td>BMI at 6 mo</td>
<td>0.15 ± 1.02</td>
<td>0.22 ± 1.00</td>
</tr>
</tbody>
</table>

\(^1\) \(z\) score calculations were based on the reference of Marsál et al (24) at birth and WHO growth charts at 6 mo (25).

\(^2\) Adjusted for prepregnancy BMI, gestational weight gain, parity, birth weight, gestational age, and infant sex. Birth weight \(z\) score adjusted for prepregnancy BMI, gestational weight gain, parity, gestational age, and infant sex.

\(^3\) All values are means ± SDs. There were no significant differences between the 2 groups.
REFERENCES


We express our deepest gratitude to the study participants for their time and effort.

The authors’ responsibilities were as follows—EMC, DC, KFM, and OP: designed the research; EMC, AK, KMR, and OP: conducted the research; EMC: provided essential materials and had primary responsibility for the final content of the manuscript; EMC and OP: analyzed data; and all authors: wrote the manuscript and read and approved the final manuscript. None of the authors had a potential conflict of interest.