

A Comparative Study of Breastfeeding During Pregnancy: Impact on Maternal and Newborn Outcomes

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ABSTRACT

Background: Despite widespread cultural vilification, lactation–pregnancy overlap remains common. Its actual adverse effects remain uncertain.

Purpose: This study compared rates of success in reaching full-term delivery and newborn birth weights between two groups of multiparous pregnant women: those who breastfed during pregnancy and those who did not.

Methods: This was a comparative study conducted over 9 months, which examined two groups of women in the maternity units of two hospitals in Birjand, Iran. The first group comprised 80 women who breast-fed for 30 days or more during pregnancy; the second group comprised 240 women who did not. The two groups had similar distributions in terms of maternal age, parity, medical/midwifery problems, and nutritional changes during pregnancy. Two trained nurses used a self-developed questionnaire to collect data.

Results: Results found no significant difference in full-term or non-full-term births rates and mean newborn birth weight between the two groups. We further found no significant difference between full-term or non-full-term births and mean newborn birth weight for those who continued and discontinued breastfeeding during pregnancy in the overlap group.

Conclusions/Implications for Practice: Results suggest that breastfeeding during normal pregnancy does not increase chance of untoward maternal and newborn outcomes. Nurses and midwives should give expectant mothers appropriate evidence-based guidance and focus attention on promoting proper nutritional intake based on lactation status during pregnancy.

KEY WORDS:

breastfeeding, pregnancy, infant feeding, birth weight, abortion.

term and include lower risk of breast cancer and increased adult intelligence (Cunningham et al., 2010).

Conception can occur while a mother is still breastfeeding in cultures wherein lactation durations are long. Widespread beliefs hold that pregnancy and lactation are incompatible and that breastfeeding during pregnancy is harmful to the fetus. In many regions of the world, women breastfeed one child while pregnant with the next (Merchant, Martorell, & Hass, 1990a).

An estimated 50% of pregnant women in Guatemala and 10% in Peru breastfeed their older children (Merchant, Martorell, & Hass, 1990b; Marquis, Penny, Diaz, & Marin, 2002). Breastfeeding concurrent with unintended pregnancy is more prevalent in developing countries, and some women choose not to wean toddlers while pregnant, despite cultural pressures (Shaaban & Glasier, 2008).

The health risks and possible adverse effects of the lactation–pregnancy overlap are unclear (Merchant et al., 1990b; Onwudiegwu, 2000). Low birth weight is a potential side effect because of the relatively high energy demand of lactation as compared with pregnancy (Verd, Moll, & Villalonga, 2008).

Oxytocin released from the posterior pituitary during breastfeeding stimulates uterine contraction and facilitates postpartum uterine involution. Therefore, it is possible that breastfeeding during pregnancy can lead to impaired uteroplacental blood flow, fetal growth retardation, premature labor, low birth weight, abortion, and intrauterine death (Onwudiegwu, 2000).

Oxytocin's role in the early phases of uterine activation and its singular role in the expulsive phase of labor remain unresolved issues (Cunningham et al., 2010). The few

Introduction

Breastfeeding provides age-specific nutrients, immunological factors, and antibacterial substances. The benefits of breastfeeding to both mother and infant are likely long-

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studies that have examined the consequences of lactation–pregnancy overlap have generated uncertain results (Eckford & Westgate, 1997; Marquis, Penny, Zimmer, Diaz, & Marin, 2003). This study compared rates of success in reaching full-term delivery and newborn birth weights between two groups of multiparous pregnant women: those who breast-fed during pregnancy (overlap group) and those who did not (nonoverlap group).

Methods

Study Design and Participants

This comparative study targeted multiparous pregnant women who breastfeed and who do not during their current pregnancy in the maternity units of Valiasr and Tamine Ejtemaie hospitals in Birjand, a city in eastern Iran of about 200,000 population. Researchers conducted the study between April and December 2008. Information on success in reaching full-term delivery and newborn birth weight were collected on 320 multiparous women in the two groups. There were 80 women in the overlap and 240 women in the nonoverlap group after vaginal delivery, caesarean, still birth, abortion, or premature labor.

Inclusion criteria included multiparous pregnant women with vaginal or caesarian delivery, abortion, premature birth, or stillbirth in their current pregnancy and who were ≥ 20 years of age. Primiparous women and those with health conditions associated with premature delivery, fetal growth retardation, and increased risk of abortion and stillbirth (hypertension, diabetes, etc.) or those younger than 20 years of age were excluded (Cunningham et al., 2010). All qualified pregnant women who breast-fed their older child during their current pregnancy were informed about the aims of the study, and those who agreed to participate were enrolled as participants. After signing informed consents, participants were interviewed and asked to answer the research questionnaire items.

The overlap group comprised multiparous women who breast-fed an older child three to five times a day for at least 30 days during their current pregnancy. The nonoverlap group comprised multiparous pregnant women who stopped breastfeeding at least 3 months before and did not breast-feed during their current pregnancy (Ishii, 2009). Two trained clinical nurses blinded to study aims selected multiparous women and received 12 hours of training by the two researchers on participant characteristics, selection methodology, interview content, interview approach and scheduling, and standardized newborn weighing procedures.

The two clinical nurses identified 3,304 women over a 9-month period. Researchers excluded 989 women who were primiparous and 7 women who had systemic diseases. Of the 2,308 qualified multiparous mothers, the 80 who breast-fed their older children during their current pregnancy were all assigned to the overlap group. Three mothers meeting nonoverlap group qualifications were recruited

from the same hospital as each overlap group participant. The two groups were matched according to maternal age, parity, medical and midwifery problems, and nutritional changes during pregnancy using group matching.

Data Collection

Overlap group questionnaires addressed maternal age, parity, whether women reached full-term delivery for cesarean/vaginal delivery (abortion, still birth, and premature delivery were considered as not reaching full-term delivery), age of the breast-fed child at the onset of pregnancy, duration of breastfeeding concurrent with new pregnancy, nutritional changes during pregnancy, breastfeeding duration and pattern (continued, decrease, and stopped) changes after realizing new pregnancy, newborn birth weight, and maternal morbidity during pregnancy. Nonoverlap group questionnaires were the same as those of the overlap group, with the exception of breastfeeding questions, which were omitted.

Researchers designed questionnaires based on guidance from textbooks and previous studies and piloted it on 8 women in the overlap group and 17 women in the nonoverlap group. The Cronbach's alphas for the two groups were .90 and .88, respectively. Final version questionnaires incorporated a post-pilot study review by six experts (pediatricians and gynecologists). Interviews were conducted when participants were in stable condition at an average of 24 hours after vaginal delivery, caesarean, still birth, abortion, or premature labor. Mean survey completion time was 15 ± 2.5 minutes.

Infant weight was promptly measured in the delivery room after birth using a digital electronic infant scale (SECA727, Serial interface RS232, Seca Corporation, Vogel & Holke, Germany) sensitive to 2 g. To avoid interobserver bias, one trained nurse weighed all the newborns in each maternity unit.

Confounder data included the following: maternal age and parity—collected during the interview process; medical and midwifery problems during pregnancy (e.g., onset of hypertension, urinary infection, and vaginal bleeding)—confirmed by a gynecologist in the medical record; and data on nutritional changes—collected during interviews using questions, “What were the main postpregnancy changes in your nutrition?,” “How long did you continue such nutrition changes during pregnancy?,” and “Who recommended dietary changes to you?” Answers were classified as (1) *major changes*, which included maintaining a balanced diet and adding vitamin supplements, animal protein, and physician-prescribed ferrous sulfate tablets; (2) *moderate changes*, which included maintaining a balanced diet with the addition of only two items from No. 1 above for a period of 0–3 months; and (3) *no change*, which included none of prescribed items.

Ethical Considerations

The ethics committee of the Birjand University of Medical Sciences approved this study. Each participant provided

written consent and filled in questionnaires anonymously. Participant data were associated with numbers rather than participant names.

Data Analysis

Data were analyzed using descriptive (frequency, mean, and standard deviation) and inferential statistics (Chi-square test, Fisher exact test, independent *t* test, Mann–Whitney U tests, logistic and linear regression analysis, and Pearson correlation test) using SPSS 16.0 software (SPSS, Inc., Chicago, IL, USA). Statistical significance was set at $p \leq .05$.

Pregnancies with concomitant urinary infection, hypertension, and vaginal bleeding were categorized as “problematic.” Whether full-term delivery was achieved (dependent variable) is a dichotomous variable: (1) full-term birth (total number of cesarean and vaginal deliveries) and (2) did not reach full term (total number of abortions, still births, and premature deliveries). Data cleaning was done in the field before one trained operator started entering all data into an SPSS file. Data entry errors were resolved through a manual review of files and questionnaires.

Results

Of the 2,308 multiparous pregnant women initially identified as the target population, this research studied 80 overlap group participants and 240 nonoverlap group participants.

Breastfeeding

In terms of breastfeeding pattern change after being informed of pregnancy, 28 (35%) in the overlap group stopped breastfeeding immediately, 42 (52.5%) decreased breastfeeding frequency, and 10 (12.5%) continued to breastfeed without change before pregnancy. The four (5.2%) older children in this group who continued exclusive breastfeeding were in the 3–6 months of age (three children, 3.9%) and 7 months of age (one child, 1.25%). There was no significant difference between full-term or non-full-term births and

breastfeeding patterns to older children in the overlap group ($p = .69$).

In the overlap group, 49 (61.3%) of mothers breastfed their older children during the first trimester only (30–90 days), 21 (26.2%) did so during the first and second trimesters, and 10 (12.5%) did so during the first through third trimesters. Researchers identified no significant difference between breastfeeding in different trimesters and full-term or non-full-term births ($p = .36$). Mean breastfeeding duration during pregnancy was 98.77 days (range, 30–270 days).

Achieving Full-Term Delivery

Table 1 shows participant characteristics and newborn birth weight means for the two groups. There were two (2.5%) and five (2.08%) stillbirths and five (6.25%) and nine (3.75%) abortions in the overlap group and nonoverlap group, respectively. Neither group experienced premature births.

Problems during pregnancy included infection (3, 3.75%), hypertension (4, 5%), and bleeding (3, 3.75%) in the overlap group and infection (9, 3.8%), hypertension (10, 4.16%), and bleeding (9, 3.8%) in the nonoverlap group. There was no significant difference in full-term or non-full-term births and problems during pregnancy in the overlap ($p = .58$) and nonoverlap ($p = .065$) groups. Of those with health problems in the overlap group, only two stopped breastfeeding, whereas two continued and six decreased breastfeeding.

There was no significant difference in older child age at onset of pregnancy between the two groups ($p = .3$). Mean of interval since previous pregnancy was 13.86 ± 4.5 months for the overlap group and 14.79 ± 7.5 months for the nonoverlap group ($p = .3$). Mean interval between previous and current pregnancy for non-full-term birth participants was 12.2 ± 5.4 months for the overlap group and 13.9 ± 7.1 months for the nonoverlap group. There was no statistical difference between the two groups ($p = .63$).

TABLE 1.

Comparative Characteristics of Women and Newborn Birth Weight Means in the Two Groups

Variable	Overlap ($n = 80$)				Nonoverlap ($n = 240$)				<i>p</i>
	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>n</i>	%	
Child number	2.9	1.3			2.8	1.0			.57
Pregnancy problems			10	12.6			28	12.8	.84
Nutritional change			9	11.2			26	10.8	.91
Did not reach full term			7	8.8			14	5.8	.36
Birth weight (g)	2939.4	725.1			3008.5	664.6			.45
Mother age (years)	28.4	4.6			29.6	5.7			.07

Note. Pregnancy problems: onset of infection, hypertension, and vaginal bleeding during pregnancy.

In the overlap group, the mean interval between previous pregnancy and current termination for non-full-term birth participants was 14 ± 4.4 months and between previous pregnancy and current birth for full-term birth participants was 12.3 ± 6.3 months (*p* = .68).

Table 2 shows participant children ages along with the number of breastfeeding days and whether the current pregnancy was in full term or not. Researchers identified no significant difference between the number of breastfeeding days and whether a newborn was a full-term birth or not (*p* = .29). Table 3 illustrates associations between breastfeeding patterns and duration and whether the women achieved full-term delivery or not.

Newborn Weight

There was no significant difference (*p* = .45) between mean birth weights in the overlap (2,939.4 ± 725.1 g) and nonoverlap (3,008.5 ± 664.6 g) groups. A Pearson correlation test showed no significant correlation between newborn weight and number of breastfeeding days (*r* = -.14, *p* = .27).

There was no significant difference in birth weight between newborns whose mothers continued (2,904.8 ± 654.4 g) and discontinued (3,005.9 ± 855.4 g) breastfeeding (*p* = .57). After employing linear regression analysis to examine links between both breastfeeding pattern and duration and birth weight, researchers found no significant difference between either breastfeeding pattern (*p* = .52) or breastfeeding duration (*p* = .25) and birth weight.

Discussion

Lactation–pregnancy overlap is a worldwide phenomenon (Moscone & Moore, 1993). Results of this study found no significant difference in full-term or non-full-term birth and mean newborn birth weight between the two groups.

Birth Weight

Although this study found no significant difference between mean birth weights in the two groups, nonoverlap group infants were an average 69.1 g heavier than their

TABLE 3.
Odds Ratio of Pattern and Duration of Breastfeeding to Reaching Full-Term Delivery

Variable	OR	95% Confidence Interval	<i>p</i>
Breastfeeding pattern (stop)	Reference		
Breastfeeding pattern (decrease)	0.15	[0.01, 1.86]	.14
Breastfeeding pattern (continue)	2.78	[0.39, 19.40]	.30
Breastfeeding days	1.00	[0.99, 1.01]	.50

Note. Dependent variable (whether full-term delivery was achieved) is a dichotomous variable: (1) full-term birth (total number of cesarean and vaginal deliveries) and (2) did not reach full term (total number of abortions, still births, and premature deliveries).

overlap group peers. Other studies have shown similar results. In one study in which lactation overlapped with pregnancy in 253 (50.2%) of 504 pregnancies, overlap was also associated with a nonsignificant decrease of 30 g in birth weight (Merchant et al., 1990a). In another descriptive study, of 133 pregnant women, 68 who breastfed during pregnancy had infants with normal birth weight (Marquis et al., 2002), and also in a case study, infants of two pregnant women who breastfeed had normal birth weights (Onwudiegwu, 2000).

The energetic stress of overlap probably is not associated with low birth weight in normal pregnancies. The negligible lower birth weights of infants in the overlap group may be because of maternal milk production. Nutritional stresses vary from woman to woman and from pregnancy to pregnancy (Merchant et al., 1990a). Careful attention is needed to recommend a proper nutrition regimen for pregnant women who are continuing to lactate. Women who are pregnant and lactating may consume more vitamins and minerals. In the overlap group, non-exclusive breastfeeding and mixed feeding were more common, which may be associated with overfeeding (especially high caloric foods), weak suckling, and incomplete breast

TABLE 2.
Older Child Age Based on Breastfeeding Days (Overlap Group)

Item	Breastfeeding Days					
	30–90		91–180		181–270	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Age (months)						
3–12	14	17.5	9	11.3	6	7.5
13–18	35	43.8	11	13.8	4	5.0
19–25	0		1	1.3	0	
Did not reach full term	4	5.0	1	1.3	2	2.5

milk emptying because of satiety of the older child during pregnancy.

Reaching Full-Term Delivery

This study found no statistically significant difference between the two groups in terms of attaining full-term delivery. These findings dovetailed with several other studies, including one comparative study of 110 overlap and 774 nonoverlap women (Ishii, 2009) and a case report on two women with 5–6 months of lactation during pregnancy (Onwudiegwu, 2000). However, another case report described an overlap woman at 28-week gestation experiencing a significant painless hemorrhage. This woman reported a history of pre-eclampsia, miscarriage, and ectopic pregnancy (Eckford & Westgate, 1997). Greater precaution for breastfeeding during high-risk pregnancies is thus suggested.

Nipple stimulation increases plasma oxytocin during pregnancy, although a magnitude of increase is less in non-pregnant and postpartum breastfeeding women (Amico & Finley, 1986). This is likely because of an indirect inhibitory effect of high estrogen and progesterone levels during pregnancy (Eckford & Westgate, 1997). Progesterone may also act within the myometrial cell to increase oxytocin receptor degradation and inhibit oxytocin activation of its receptor at the cell surface. Progesterone maintains uterine quiescence by inhibiting myometrial oxytocin response (Cunningham et al., 2010). Uterine contractions stimulated by breastfeeding usually pose no danger to the unborn baby and do not increase risk of premature delivery (La Leche League International, 2003). The amount of oxytocin alone during lactation probably is insufficient to trigger a miscarriage or other untoward event.

The stillbirth and abortion rate in this study of 8.8% in the overlap group was similar to the spontaneous abortion rate of 7.3% reported by Ishii (2009) for their overlap group. There were no statistically significant differences between abortion rate in overlap and nonoverlap groups in Ishii's study and in this study. Spontaneous abortion occurs in 10%–15% of all pregnancies (Kumar, Abbas, Fausto, & Aster, 2010; Nybo Andersen, Wohlfahrt, Christens, Olsen, & Melbye, 2000). The abortion rates reported by this study and by the study of Ishii (2009) are below the reported global spontaneous abortion rate. This is likely because both studies omitted high-risk pregnancies from sample populations. In a descriptive study of 2,617 parous pregnant women, 661 (25.3%) conceived while still breastfeeding (Shaaban & Glasier, 2008). They reported 22% miscarriages for their entire sample. Shaaban explained that their sample included women in high-risk pregnancy categories. Causes of spontaneous abortion include both fetal and maternal chromosomal anomalies (Verd et al., 2008).

This study did not include women who aborted early in their pregnancy. Many early abortions do not involve

hospitalization and may lack severe symptoms. We identified no significant difference in the full-term or non-full-term births for those who continued and discontinued breast-feeding. Also, we found no significant difference among breastfeeding in different trimesters and the full-term birth or non-full-term birth ratio. This suggests that lactation during early, middle, or late pregnancy does not significantly affect chances of reaching full-term delivery in normal pregnancies.

Breastfeeding During Pregnancy

In this study, 12.5% of women surveyed continued to breastfeed after pregnancy. We found no significant correlation between breastfeeding patterns and chances of reaching full-term delivery. Mean breastfeeding days in this study totaled 98.77, and breastfeeding decreased with increased gestational age of pregnant mother. These results concurred with those of several other studies (Merchant et al., 1990b; Moscone & Moore, 1993). Difference between duration of lactation during pregnancy in different countries likely relates to cultural beliefs.

The first trimester is the most risky period for pregnancy. Most participants ($n = 49$) in the overlap group continued to breastfeed during this period, and four did not reach full term. Although we identified no significant difference between breastfeeding during different trimesters and whether a woman achieved a full-term birth or not, pregnant women should still be informed regarding the potential hazards of overlap breastfeeding.

Conclusions

This study supports the position that breastfeeding during normal pregnancy is not associated with higher risks of untoward maternal and newborn outcomes. Overlap breastfeeding is a personal decision for mothers. Because this study purposely excluded high-risk pregnancies, future research may expand the scope of research to further investigate the broader associations between lactation–pregnancy overlap and mother–newborn adverse outcomes.

Application to Nursing Practice

This study suggests that overlap breastfeeding is not associated with untoward maternal and newborn outcomes in normal pregnancies. The authors hope findings can assist nurses and midwives to improve their education about breastfeeding and provide appropriate evidence-based advice. Greater attention to proper nutrition for lactating pregnant women is needed.

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懷孕期間母乳哺餵的比較型研究：對母親及新生兒結果的影響

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- 背景** 儘管許多文化上證實，懷孕期哺乳仍是常見的，其存在的副作用仍不清楚。
- 目的** 本研究比較有進行懷孕期哺乳及未進行懷孕期哺乳的多胎懷孕婦女，其足月生產的成功率及新生兒體重的情形。
- 方法** 本研究為一進行九個月的比較型研究，比較在伊朗Birjand兩個醫院的產科門診的兩組婦女。第一組為80位懷孕期哺乳超過30天或以上的婦女，第二組為240位懷孕婦女未進行懷孕期哺乳。兩組婦女在年齡、生產次數、醫療/助產上的問題、及懷孕期營養的改變的分布情況均相似。兩位經過訓練的護理師使用自擬的問卷進行資料的收集。
- 結果** 本研究結果顯示，兩組婦女之足月生產率沒有統計上差異。我們進一步發現，足月產與非足月產新生兒，其出生體重在兩組間亦無統計上差異。
- 結論／實務應用** 研究結果建議，懷孕期哺乳並不會增加母親及新生兒不良結果的危險性。護理師或助產士應提供準媽媽適合的實證指引及著重懷孕期間哺乳的適當營養攝取。

關鍵詞： 哺乳、懷孕、嬰兒餵食、出生體重、流產。

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