

Breastfeeding in women with rheumatic diseases

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ABSTRACT

Objective Many rheumatologists and women with rheumatic disease worry that the disease or treatment will prevent breast feeding. International guidelines establish, however, that most antirheumatic medications are compatible with breast feeding. We sought to identify the frequency and predictors of desire to and actually breast feeding in women with rheumatic diseases.

Methods Pregnant women with rheumatic disease were enrolled prospectively. Demographics and breastfeeding intention were collected at study entry, while actual breastfeeding decision was recorded postpartum. Maternal diagnosis, demographics and medication use was collected throughout the study. Predictors of breast feeding and intention were identified using stepwise logistic regression.

Results A total of 265 pregnancies were included in the study, 88 with SLE, 33 with undifferentiated connective tissue disease, 100 with arthritis and 44 with other rare rheumatic diagnoses. Of these, 79% intended to breastfeed, 84% of women ever breast fed and 65% were still breast feeding at an average of 7.6 weeks postpartum. Medication concern was the most commonly cited reason not to breastfeed though only 5% of women were taking or planning to start a non-lactation compatible medication at their postpartum visit. In multivariate analysis, women with a college degree were more likely and women with SLE were less likely to intend to breastfeed. Actual breast feeding was most strongly predicted by the woman's intention to breastfeed, but also increased with maternal age, decreased if the baby was born preterm and decreased the further the postpartum appointment occurred from delivery.

Conclusion This study demonstrates that the majority of women with rheumatic disease want to and can breastfeed successfully. Additionally, very few women required a medication that was not compatible with breast feeding to control their rheumatic disease in the postpartum period. Despite this, an important minority of patients did not continue breast feeding due to their personal concerns about the risks of antirheumatic medications to their infant.

INTRODUCTION

Breast feeding is considered an ideal way for a mother to feed her child and has both bonding and health benefits for the infant and the mother.¹ The American Academy of Pediatrics recommends breast feeding as an infant's only nutrition source for the first 6 months, as well as continued breast feeding

Key messages

What is already known about this subject?

- ▶ Many women with rheumatic conditions want to breastfeed.
- ▶ Many rheumatologists and women with rheumatic disease worry that the disease or treatment will prevent breast feeding.

What does this study add?

- ▶ This study demonstrates that the large majority of women can be managed postpartum with medications that are compatible with lactation: only 25% had moderate to severe disease activity and only 5% required a non-lactation compatible medication.
- ▶ While population-based studies typically suggest demographic factors as the primary drivers of breast feeding, our study has also identified infant health and concerns about the safety of medications as important factors in this unique population.

How might this impact on clinical practice or future developments?

- ▶ To support all women who wish to breastfeed to do so, it is important that medication concerns, often fuelled by well-meaning providers, family members and the media, be addressed with both empathy for the worries of a new mother and enhanced data.

for at least 1 year.² In the USA, the actual number of women breast feeding is below this goal, with half of infants receiving breast-milk at 6 months of age.³ Although American women met the 2010 Healthy People goal for 75% of new mothers to initiate breast feeding, the rates of prolonged and exclusively breast feeding were below the targets.⁴ In North Carolina, which is where our study took place, 85% of mothers tried to breastfeed in 2015, 59% of mothers were breast feeding at 6 months and 33% at 12 months.⁵ Prior studies have identified five key determinants of breastfeeding duration and exclusivity: demography, biology, attitudes, hospital practices and social norms.⁴

Current guidelines from the American College of Rheumatology (ACR), the British Society of Rheumatology (BSR) and the European League Against Rheumatism (EULAR)



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all agree that most medications used to manage rheumatic diseases are compatible with breast feeding, including antimalarials, sulfasalazine, azathioprine, ciclosporin, tacrolimus, colchicine, intravenous immunoglobulin, glucocorticoids and all biologicals.^{6–8}

This study sought to identify the frequency and predictors of the desire to and actually breast feeding in women with a range of rheumatic diseases. We hypothesise that the breastfeeding rates of women included in this study will reflect the common demographic determinants but that the health of the mother and infant and the safety of antirheumatic medications would also play a role in breast feeding.

METHODS

This study was conducted within the Duke Autoimmunity in Pregnancy (DAP) Registry, which enrolls consecutive pregnant women with rheumatic disease seen in the university's rheumatology clinic. The data were collected prospectively from 2008 to 2018.

All study visits were conducted by the same attending rheumatologist (MC). At study entry, patients completed a survey on paper including questions on income level, educational attainment, breastfeeding intention and disease activity. A similar survey was completed at the postpartum visit, which was typically 5–12 weeks after delivery, highlighting the ultimate breastfeeding decision. Intention to breastfeed was divided into two groups: intention to breastfeed (exclusively or in combination with formula) versus exclusive formula feeding or unsure of feeding plans. Infant feeding at follow-up was divided into two groups: current breast feeding (either exclusively or in combination with formula) versus exclusive formula feeding. One mother who was using donor milk at follow-up was excluded from analysis of breast feeding at follow-up but remained in the intention to breastfeed analysis.

Information on the delivery, including delivery method, gestational age, birth weight, whether the infant was preterm and whether the infant was admitted to the neonatal intensive care unit (NICU) was recorded from the medical record, when available, or from the report of the mother. Medications were considered compatible with breast feeding based on the ACR Reproductive Health Guidelines.⁷ Incompatible medications included cyclophosphamide, mycophenolate mofetil, methotrexate, leflunomide and tofacitinib. Disease activity at the postpartum was based on the physician global assessment score (PGA). The range of the SLE PGA differs from the PGA for other rheumatic diseases. For SLE and undifferentiated connective tissue disease (UCTD), the score ranges from 0 to 3, with a 0 representing no disease activity; a PGA of 0–<1 was considered low activity, PGA 1–<2 was moderate activity and PGA ≥ 2 severe activity. For other rheumatic diseases, patients are assessed on a scale of 0–10 with 0 representing no disease activity; a PGA of 0–33 was considered low activity, PGA 34–67 was

moderate activity and PGA ≥ 68 severe activity. A PGA score was missing for four patients (one patient with SLE, one patient with Sjogren's, one patient with scleroderma and one patient with positive antibodies). For analysis, disease activity was categorised as low activity versus moderate or severe activity.

For analysis, patients were grouped into four diagnostic categories: SLE, UCTD, inflammatory arthritis (including rheumatoid, psoriatic, juvenile idiopathic arthritis and spondyloarthropathies) and other rare rheumatic diseases (vasculitis, scleroderma, sarcoidosis, inflammatory eye disease and others). SLE was the referent group for comparisons.

Differences in breastfeeding intention and breast feeding at follow-up by demographics, diagnosis, disease activity and health of the baby were estimated by Fisher's exact test for categorical variables and analysis of variance or t-tests for continuous variables. Univariate logistic regression models calculated crude ORs and 95% CIs to estimate associations between breast feeding and each maternal factor. Backward regression was used to determine the final predictive model, with variables with p values < 0.05 retained in the final model. All analyses were conducted with SAS V.9.4 (Cary, North Carolina, USA).

Patient and public involvement

Patient collaborators were not directly involved in the recruitment, conduct or dissemination of the study. Women within the Duke Autoimmunity in Pregnancy Patient Advisors and Collaborators, however, have expressed a high degree of interest in breast feeding.

RESULTS

A total of 265 pregnant women were included in the study: 88 with SLE, 33 with UCTD, 100 with arthritis and 44 with other rheumatic diagnoses (table 1). Overall, most patients were white, had at least a college education, earned above \$50 000 per year, were married or living with a partner and had private or military health insurance (table 1). The mean age was 31.3 years. Most patients had low disease activity at the postpartum visit, with no differences in disease activity by diagnosis. Relative to inflammatory arthritis and UCTD patients, patients with SLE were more likely to be black, not have a college degree and have an annual income less than \$50 000.

While pregnant, 13% indicated that they would only use formula, 28% planned to both breastfeed and use formula and 51% planned to only breastfeed. An additional 8% of mothers were unsure if they would breastfeed their baby. In the days after delivery, 84% of women tried to breastfeed. At the postpartum visit, on average 7.6 weeks after delivery, two-thirds of women were breast feeding. Of those still breast feeding, two-thirds were only breast feeding and one-third were feeding with a combination of breastmilk and formula (table 1). One woman was feeding her baby with donor milk only.

Table 1 Descriptive characteristics of the women for each pregnancy

	Overall	SLE	UCTD	Arthritis	Rare rheumatic diseases	P value
Number of pregnancies	265	88	33	100	44	
Average age	31.3 (5.5)	30.0 (4.8)	30.7 (5.3)	32.2 (5.3)*	32.2 (6.8)	0.03
Weeks postpartum of visit	7.6 (4.6)	7.5 (4.2)	8.0 (4.2)	7.3 (4.6)	8.0 (5.5)	0.8
Number of people to count on for help and support (n=254)	4.5 (1.7)	4.6 (1.9)	4.2 (1.5)	4.4 (1.6)	4.7 (1.3)	0.5
Maternal race, n (%)						
White	184 (69)	41 (47)	24 (73)	89 (89)	30 (68)	
Black	59 (22)	39 (44)	4 (12)†	7 (7)*	9 (20)‡	<0.0001
Asian	16 (6)	6 (7)	2 (6)	4 (4)	4 (9)	
Other	6 (2)	2 (2)	3 (9)	0 (0)	1 (2)	
Education (n=260), n (%)						
<College degree	76 (29)	29 (35)	11 (33)	22 (22)	14 (33)	0.2
≥College degree	184 (71)	55 (65)	22 (67)	78 (78)	29 (67)	
Annual income (n=246), n (%)						
<\$50 000	72 (29)	30 (39)	7 (23)	20 (21)*	15 (37)	0.03
≥\$50 000	174 (71)	47 (61)	24 (77)	77 (79)	26 (63)	
Insurance (n=258), n (%)						
Medicaid, Medicare or none	50 (19)	18 (21)	7 (23)	15 (15)	10 (23)	0.5
Private or military	208 (81)	66 (79)	24 (77)	85 (85)	33 (77)	
Marital status (n=258), n (%)						
Single, divorced or separated	36 (14)	18 (22)	2 (6)	8 (8)*	8 (19)	0.02
Married/with partner	222 (86)	64 (78)	31 (94)	92 (92)	35 (81)	
Disease activity at postpartum visit (n=261), n (%)						
Low	196 (75)	64 (74)	29 (88)	70 (70)	33 (80)	0.2
Moderate	59 (23)	22 (25)	3 (9)	26 (26)	9 (20)	
Severe	6 (2)	1 (1)	1 (3)	4 (4)	0 (0)	

*Indicates p value <0.05 for arthritis compared with SLE.

†Indicates p value <0.05 for UCTD compared with SLE.

‡Indicates p value <0.05 for other rare rheumatic diseases compared with SLE.

UCTD, undifferentiated connective tissue disease.

Almost all women reported they breastfed to keep their baby healthy and to increase bonding, with many also citing the benefits of weight loss, keeping costs low, improving baby's IQ and for convenience. More than half of the women who reported they had stopped breast feeding did so due to a low milk supply. The primary reported reason for never breast feeding was medication concerns.

Breast feeding was more common in women with UCTD and inflammatory arthritis than for women with SLE. Compared with women who were exclusively using formula, breast feeding was more common in women who were not black, had a college degree, had an annual income over \$50 000, had private or military insurance and were married. Women who were breast feeding were older than women exclusively using formula. Maternal education trumped race: 70% of black women and 75% of non-black women with a college degree were breast

feeding at follow-up (p=0.6). However, of those without a college degree, 29% of black women were breast feeding at follow-up compared with 53% of non-black women (p=0.04).

Several factors specific to the pregnancy were also predictive of breast feeding. Women with low disease activity were more likely to breastfeed at follow-up compared with women with moderate or severe disease activity (70% vs 48%; p=0.003). Additionally, babies that were admitted to the neonatal intensive care unit or were born preterm were less likely to be breast fed at follow-up (table 2).

Only 4 (1.5%) of the 265 women were taking a medication that are not considered compatible with breast feeding at the postpartum visit, including mycophenolate (n=2) and methotrexate (n=2). An additional 10 women (3.8%) were planning to start a non-compatible medication at the postpartum visit. This included mycophenolate

Table 2 Medications prescribed in the postpartum period

	Overall	SLE	UCTD	Arthritis	Rare rheumatic diseases	P value
Number of pregnancies	265	88	33	100	44	
Compatible medications, n (%)						
Hydroxychloroquine	130 (49)	70 (80)	20 (61)	24 (24)*	16 (36)†	<0.0001
Azathioprine	17 (6)	13 (15)	0 (0)‡	2 (2)*	2 (5)	0.002
NSAIDs	78 (29)	14 (16)	8 (24)	43 (43)*	13 (30)	0.0006
Prednisone	63 (24)	32 (36)	1 (3)‡	23 (23)	7 (16)	0.0003
TNF inhibitors	39 (15)	0 (0)	0 (0)	38 (38)*	1 (2)	<0.0001
Sulfasalazine	15 (6)	0 (0)	0 (0)	15 (15)*	0 (0)	<0.0001
Non-compatible medications, n (%)						
Taking at follow-up	4 (1.5)	2 (2)	0 (0)	1 (1)	1 (2)	0.8
Starting at follow-up	10 (3.8)	3 (3)	0 (0)	7 (7)	0 (0)	0.2

*Indicates p value <0.05 for arthritis compared with SLE.

†Indicates p value <0.05 for other rare rheumatic diseases compared with SLE.

‡Indicates p value <0.05 for UCTD compared with SLE.

NSAID, Non-steroidal anti-inflammatory drugs; TNF, Tumor Necrosis Factor; UCTD, undifferentiated connective tissue disease.

(n=2), methotrexate (n=6), tofacitinib (n=1) and leflunomide (n=1).

The majority of breastfeeding women in this study were prescribed antirheumatic medications considered compatible with breast feeding. Of women taking Tumor Necrosis Factor (TNF) inhibitors, 72% breast fed, with similar breastfeeding rates across the five TNF inhibitors (table 3). For each lactation-compliant medication, the majority of women were breast feeding, and overall, 64% of the women taking lactation-compliant medications breast fed.

Thirty-three women were not breast feeding at the follow-up visit due to self-reported concerns over medications; 25 never breast fed and 8 had stopped breast feeding. Of these 33 women, two (6%) were taking a medication considered not compatible with breast feeding and four (12%) were planning to start a non-compatible medication (table 3). Of the women on lactation compatible medications who intended to breastfeed, a quarter were exclusively using formula at follow-up and a quarter of these women were not breast feeding due to their personal concerns about medication.

Table 3 Maternal infant feeding intentions while pregnant and in the postpartum period

	Overall	SLE	UCTD	Arthritis	Rare rheumatic diseases	P value
Number of pregnancies	265	88	33	100	44	
Breastfeeding intention at cohort entry	265	88	33	100	44	0.02
Breast feeding only, n (%)	134 (51)	34 (39)	24 (73)*	54 (54)†	22 (50)	
Breast feeding+formula, n (%)	75 (28)	24 (27)	5 (15)	32 (32)	14 (32)	
Don't know, n (%)	22 (8)	12 (14%)	1 (3)*	5 (5)†	4 (9)	0.006‡
Formula only, n (%)	34 (13)	18 (20)	3 (9)	9 (9)	4 (9)	
Ever breastfed postpartum (n=263)§, n (%)	222 (84)	69 (78)	30 (91)	86 (88)	37 (84)	0.3
Breastfeeding status at postpartum visit§	264	88	33	99	44	0.01
Breast feeding only, n (%)	109 (41)	26 (30)	15 (45)	53 (54)	15 (34)	
Breast feeding+formula, n (%)	63 (24)	24 (27)	11 (33)	16 (16)	12 (27)	
Formula only, n (%)	92 (35)	38 (43)	7 (21)*	30 (30)	17 (39)	0.09¶

*Indicates p value <0.05 for UCTD compared with SLE.

†Indicates p value <0.05 for arthritis compared with SLE.

‡P values compare plan to breastfeed/breastfeed+formula versus formula only/don't know.

§Excludes one participant who used donor milk.

¶P values in this row compare breast feeding/breast feeding+formula versus formula only.

UCTD, undifferentiated connective tissue disease.

Table 4 Predictors for intending to breastfeed and breast feeding at follow-up

	Intention to breastfeed		Breast feeding at follow-up	
	Univariate	Multivariate*	Univariate	Multivariate*
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Maternal diagnosis†				
SLE	1.0 (ref)	1.0 (ref)	1.0 (ref)	–
UCTD	3.75 (1.21 to 11.66)	3.04 (0.93 to 9.99)	2.82 (1.11 to 7.19)	–
Arthritis	3.18 (1.55 to 6.51)	2.82 (1.27 to 6.24)	1.75 (0.96 to 3.19)	–
Rare rheumatic diseases	2.33 (0.96 to 5.63)	2.20 (0.83 to 5.83)	1.21 (0.58 to 2.53)	–
Maternal demographics				
Race: black	0.30 (0.16 to 0.57)	–	0.40 (0.22 to 0.73)	–
College graduate†	3.39 (1.83 to 6.30)	3.03 (1.52 to 6.01)	4.14 (2.35 to 7.29)	–
Age	1.05 (1.00 to 1.11)	–	1.10 (1.05 to 1.16)	1.12 (1.05 to 1.19)
Income ≥\$50 000	2.34 (1.22 to 4.52)	–	3.58 (2.02 to 6.37)	–
Married/living with partner	1.56 (0.70 to 3.47)	–	3.40 (1.63 to 7.08)	–
Private or military insurance	2.31 (1.16 to 4.56)	–	3.42 (1.80 to 6.49)	–
Health of the baby				
Preterm baby	–	–	0.41 (0.22 to 0.75)	0.31 (0.13 to 0.70)
NICU	–	–	0.35 (0.18 to 0.67)	–
Feeding plan during pregnancy				
Plan to breastfeed	–	–	7.18 (3.71 to 13.9)	8.29 (3.70 to 18.6)
Plan to use formula or unsure	–	–	1.0 (ref)	1.0 (ref)
Follow-up visit timing				
Weeks postpartum at visit	–	–	0.93 (0.88 to 0.98)	0.93 (0.87 to 1.00)
Postpartum disease activity				
Moderate or severe activity	–	–	0.41 (0.23 to 0.72)	–

*Backward regression was used to determine the final predictive model, with variables with p values <0.05 retained in the final model.

†Indicates p value <0.05.

NICU, neonatal intensive care unit; UCTD, undifferentiated connective tissue disease.

Whether the woman intended to breastfeed at her initial pregnancy visit was strongly associated with whether she was breast feeding at her postpartum visit. Of the women who planned to breastfeed, 94% started breast feeding, though 21% of these women had stopped by their follow-up appointment. When adjusted for maternal demographics, the key predictors for intending to breastfeed were education and maternal diagnosis (table 4). Women with a college degree were three times more likely to intend to breastfeed (OR: 3.03; 95% CI 1.52 to 6.01), and women with inflammatory arthritis were three times more likely to intend to breastfeed as compared with women with SLE (OR: 3.05; 95% CI 0.93 to 9.99).

In the postpartum period, breast feeding at the follow-up visit was primarily predicted by whether the woman had planned to breastfeed (OR: 8.29; 95% CI 3.70 to 18.59). Additionally, breast feeding increased with maternal age (OR: 1.12; 95% CI 1.05 to 1.19) and decreased if the baby was born preterm (OR: 0.31; 95% CI 0.13 to 0.70). Increased duration in weeks between delivery and the postpartum visit also decreased the likelihood of breast feeding at that visit (OR: 0.93; 95% CI 0.87 to 1.00).

DISCUSSION

The majority of women with rheumatic disease in this cohort intended to breastfeed, and 84% of them ended up doing so. This is comparable with recent population-wide data, in which an estimated 70% of women in the USA and 85% of women in North Carolina initiated breast feeding.^{3,5} The factors that increased the likelihood that a mother would breastfeed included her intention to breastfeed, which was largely influenced by her education and diagnosis, her and her baby's age at follow-up and whether the baby was born preterm. Concern about the impact of rheumatic medications on her breastfed baby was an important reason cited for not breast feeding; however, only 2% of women were taking a non-lactation compatible medication at their postpartum visit. Prior studies in women who do not live with a rheumatic disease have shown similar findings with the mother's education level, her attitudes about her capability to successfully breastfeed and her intention to breastfeed for 6 months or longer significantly correlated with breastfeeding duration.⁹

The demographic factors that drove breast feeding in this study were limited to maternal age and education, with older and more highly educated mothers more likely to breastfeed. These findings follow cultural norms for breast feeding in the USA among middle and upper middle class women. Higher educational attainment is linked to improved health outcomes overall and correlates with many social determinants: income level, community/neighbourhood environment and race relations.¹⁰ Education determines job opportunities with less-educated women undertaking lower paying jobs that often have workplace environments not conducive to breast feeding, such as limited maternity leave and limited time and space for lactation at work. While many studies identify race as an important determinant of breast feeding, in this study, more highly educated women of all races were more likely to breastfeed. Among less-educated mothers, racial differences were seen, with fewer black than white mothers choosing to breastfeed.

Infant health, coupled with maternal stress of having and caring for a baby, is also an important realm of influencers in the breastfeeding decision. Although other studies show that the breastfeeding initiation rate was comparable between mothers with preterm infants and those with full term infants, continuing breast feeding in the following weeks was higher for term infants.¹¹ Mothers of preterm infants often fear about their ability to breastfeed considering vulnerable health of their baby.¹² It is important to recognise the difficulty of breast feeding an infant in the hospital for a prolonged period and overly emphasising breast feeding can be perceived as insensitive to an already-stressed new mother.¹¹ This subset of women experiences the challenges of pumping milk, limited milk supply due to exclusively pumping and the stress of having an ill infant. Additionally, her own health may preclude her from pumping enough milk or she might be administered medications that are either not compatible with breastfeeding or limit her milk supply. One infant in this study received donor milk, highlighting this new option.

Key limitations in this study include the variation in the number of weeks after gestation postpartum visits occurred, that not all women in the entire Duke Autoimmunity in Pregnancy cohort were seen postpartum and that we do not have a control group of healthy pregnant women. We additionally lack data on the long-term health of the infants, so we cannot speculate about the safety of breast feeding on these medications. The levels of medications within breastmilk were not collected in this study. A final limitation is that although we have data on disease activity at the postpartum visits, we do not have longer term data to associate breast feeding with changes in disease activity.

In our study, infant health, as assessed by preterm delivery, was an important predictor of actual breast feeding, echoing prior research. In our cohort, the vast majority of women were on lactation-compatible medications; nonetheless, among women with rheumatic disease,

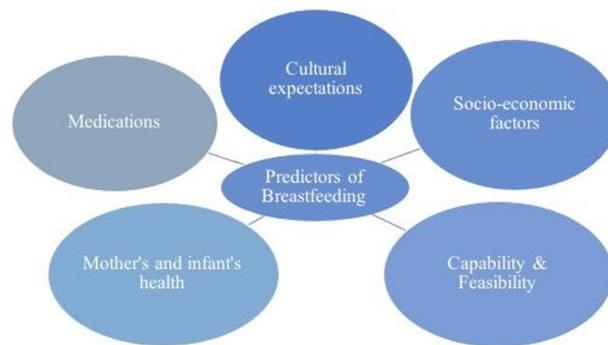


Figure 1 Multiple factors combine to predict whether a woman with rheumatic disease chooses and is able to breastfeed

actual and perceived risks of medication impacted a woman's breastfeeding choice. This adds to previously defined determinants for breast feeding including cultural expectations, socioeconomic factors and the mother's capability and feasibility as key predictors of breast feeding. We propose expanding the current breastfeeding determinant framework to include these aspects (figure 1).^{9 10 13 14} Finally, SLE diagnosis and lower educational level, the latter modified by race, also contributed to lower breastfeeding rates. Future interventions may increase breast feeding by directly addressing women's concerns about breast feeding while taking antirheumatic medications.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval The study was approved by the Duke University Institutional Review Board (Pro00000756).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. We are open to collaborative research with our team using data from the Duke Autoimmunity in Pregnancy Registry.

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