



HHS Public Access

Author manuscript

Obstet Gynecol. Author manuscript; available in PMC 2024 March 25.

Published in final edited form as:

Obstet Gynecol. 2024 March 01; 143(3): 449–455. doi:10.1097/AOG.0000000000005499.

Breastfeeding Initiation, Duration, and Associated Factors Among People With Hepatitis C Virus Infection

Jennifer L. Grasc, MD,

Jessica A. de Voest, PhD, MPH,

George R. Saade, MD,

Brenna L. Hughes, MD, MS,

Uma M. Reddy, MD, MPH,

Maged M. Costantine, MD,

Edward K. Chien, MD,

Alan T.N. Tita, MD, PhD,

John M. Thorp Jr, MD,

Torri D. Metz, MD, MS,

Ronald J. Wapner, MD,

Vishakha Sabharwal, MD,

Hyagriv N. Simhan, MD,

Geeta K. Swamy, MD,

Kent D. Heyborne, MD,

Baha M. Sibai, MD,

William A. Grobman, MD, MBA,

Yasser Y. El-Sayed, MD,

Brian M. Casey, MD,

Samuel Parry, MD,

**Eunice Kennedy Shriver National Institute of Child Health and Human Development
(NICHD) Maternal-Fetal Medicine Units (MFMU) Network***

Departments of Obstetrics and Gynecology, The Ohio State University, Columbus, Ohio, University of Texas Medical Branch, Galveston, Texas, Brown University, Providence, Rhode Island, MetroHealth Medical Center-Case Western Reserve University, Cleveland, Ohio, University of Alabama at Birmingham, Birmingham, Alabama, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, University of Utah Health Sciences Center, Salt

Corresponding author: Jennifer Grasc, MD, Department of Obstetrics & Gynecology, The Ohio State University Wexner Medical Center, Columbus, OH; Jennifer.grasc@osumc.edu.

*A list of other members of the NICHD MFMU Network is available in Appendix 1 online at <http://links.lww.com/AOG/D546>. Each author has confirmed compliance with the journal's requirements for authorship.

Financial Disclosure

Alan T.N. Tita reports money was paid to his institution from Pfizer. Torri D. Metz reports receiving royalties from UpToDate for two topics on trial of labor after cesarean delivery. Her institution received payment from Pfizer, when she was a site PI for Phase III respiratory syncytial virus (RSV) vaccine trial, and when she was a site PI for a pharmacokinetic study of Paxlovid in pregnancy for mild-to-moderate COVID-19. Geeta K Swamy reports receiving payment from GlaxoSmithKline, Pfizer, UpToDate, Sanofi, Medscape, and Moderna. The other authors did not report any potential conflicts of interest.

Lake City, Utah, Columbia University, New York, New York, Boston Medical Center, Boston, Massachusetts, University of Pittsburgh, Pittsburgh, Pennsylvania, Duke University, Durham, North Carolina, University of Colorado School of Medicine, Anschutz Medical Campus, Aurora, Colorado, University of Texas Health Science Center at Houston-Children's Memorial Hermann Hospital, Houston, Texas, Northwestern University, Chicago, Illinois, Stanford University, Stanford, California, University of Texas Southwestern Medical Center, Dallas, Texas, and University of Pennsylvania, Philadelphia, Pennsylvania; the George Washington University Biostatistics Center, Washington, DC; and the Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bethesda, Maryland.

Abstract

OBJECTIVE: To characterize breastfeeding behaviors and identify factors associated with breastfeeding initiation among people with hepatitis C virus (HCV) infection.

METHODS: We conducted a secondary analysis of a multicenter observational cohort of pregnant people with singleton gestations and HCV seropositivity. This analysis includes individuals with data on breastfeeding initiation and excludes those with human immunodeficiency virus (HIV) co-infection. The primary outcome was self-reported initiation of breastfeeding or provision of expressed breast milk. Secondary outcomes included duration of breastfeeding. Demographic and obstetric characteristics were compared between those who initiated breastfeeding and those who did not to identify associated factors. Univariable and multivariable analyses were performed.

RESULTS: Overall, 579 individuals (75.0% of participants in the parent study) were included. Of those, 362 (62.5%) initiated breastfeeding or provided breast milk to their infants, with a median duration of breastfeeding of 1.4 months (interquartile range 0.5–6.0). People with *HCV viremia*, defined as a detectable viral load at any point during pregnancy, were less likely to initiate breastfeeding than those who had an undetectable viral load (59.4 vs 71.9%, adjusted odds ratio [aOR] 0.61, 95% CI, 0.41–0.92). People with private insurance were more likely to initiate breastfeeding compared with those with public insurance or no insurance (80.0 vs 60.1%; aOR 2.43, 95% CI, 1.31–4.50).

CONCLUSION: Although HCV seropositivity is not a contraindication to breastfeeding regardless of viral load, rates of breastfeeding initiation were lower among people with HCV viremia than among those with an undetectable viral load.

CLINICAL TRIAL REGISTRATION: [ClinicalTrials.gov, NCT01959321](https://clinicaltrials.gov/ct2/show/study/NCT01959321).

The American College of Obstetricians and Gynecologists, the American Academy of Pediatrics, and the Society for Maternal-Fetal Medicine all concur that infection with hepatitis C virus (HCV) is not a contraindication to breastfeeding.^{1–4} Although breast milk contains detectable HCV RNA, the viral activity of HCV is reduced by free fatty acids in human milk,⁵ and numerous studies have demonstrated that breastfeeding is not associated with a higher risk of maternal-to-child transmission.^{3,6–10} In addition to the many well-established maternal and infant benefits of breastfeeding, neonates born to people with HCV infection and substance use disorder may also benefit from decreased severity of neonatal opioid withdrawal syndrome with administration of breast milk.^{11–13}

Nevertheless, there is a paucity of data about rates, factors, and duration of breastfeeding among people with HCV infection.^{7,8} This evidence gap leaves health care professionals with a lack of necessary information to inform counseling and address barriers to breastfeeding. The *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network HCV study represents the largest prospectively collected cohort of pregnant people with HCV seropositivity in the United States, along with robust follow-up data on participants and their offspring.¹⁴ This data set offers a unique opportunity to characterize breastfeeding behaviors in this population, and may allow the design of better interventions to address barriers and increase breastfeeding rates. Thus, in this study, we sought to explore factors associated with breastfeeding initiation among people with HCV infection during pregnancy.

METHODS

This is a secondary analysis of An Observational Study of Hepatitis C in Pregnancy, a multicenter observational cohort of pregnant people with singleton gestation and HCV seropositivity, conducted by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network.¹⁴ The IRB of The Ohio State University determined that this analysis did not require review due to use of de-identified data only.

The primary outcome was self-reported initiation of breastfeeding or provision of expressed breast milk. In the original study, breastfeeding status was assessed at two follow-up visits: 2–6 months and 18–24 months postpartum. At each visit, participants were asked, “Was the child ever breastfed or given pumped breast milk after delivery?” An affirmative answer to this question during at least one follow-up visit was considered confirmation of breastfeeding. Participants who answered “no” at all follow-up visits were included in the “never breastfed” group. Participants who did not present for any follow-up visits were excluded due to missing data for the primary outcome. Hereafter, the term “breastfeeding” is used to denote both direct breastfeeding and provision of expressed breast milk. In this analysis, we included all people who were enrolled in the parent study and had a live birth. We excluded people with missing data on breastfeeding initiation and those with human immunodeficiency virus (HIV) co-infection, because this is a contraindication to breastfeeding in the United States. We compared characteristics between those excluded and included in the analysis.

For those who breastfed, the duration of breastfeeding was also assessed. Participants who initiated breastfeeding were asked at each follow-up visit whether they were still breastfeeding. If they were no longer breastfeeding, they were asked the length of time they breastfed. Participants who were still breastfeeding at the 2–6-month follow-up visit and did not have an 18–24-month follow-up were excluded from the duration of breastfeeding calculation. For participants who were still breastfeeding at the 18–24-month visit, the age of the child at that visit was used to calculate duration.

Overall breastfeeding initiation and continuation rates were calculated. We compared potential associated factors between those who initiated breastfeeding and those who did

not. Potential factors, selected a priori using a conceptual framework based on previously published literature and clinical expertise,^{15,16} included maternal age, prepregnancy body mass index (BMI, calculated as weight in kilograms divided by height in meters squared), race and ethnicity (understood as a social construct), marital status, insurance status, education, employment, income, chronic hypertension, hypertensive disorder of pregnancy, pregestational diabetes, gestational diabetes, tobacco use, alcohol use, illicit drug use, buprenorphine or methadone use during pregnancy, hepatitis B or D, HCV viremia (assessed at study enrollment, 24–28 weeks of gestation, 32–36 weeks of gestation, and delivery), cesarean delivery, hemorrhage at time of delivery, preterm delivery before 37 weeks of gestation, gestational age at delivery, and neonatal intensive care unit admission.

Continuous variables were compared by using the *t* test or Wilcoxon rank-sum test and categorical variables were compared by using the χ^2 or Fisher exact test, as appropriate. Factors that reached $P < .10$ in bivariate analyses were further considered in multivariable analysis, and backwards elimination was used to determine the final model for factors associated with breastfeeding. Logistic regression was used to calculate odds ratios and 95% CIs. $P < .05$ was considered statistically significant. Imputation for missing data was not performed. Because this was an exploratory analysis, no formal power analysis or correction for multiple comparisons was conducted. All analyses used SAS 9.4.

RESULTS

Of 772 people with HCV seropositivity enrolled in the original study, nine were excluded due to nonlive births, and eight were excluded due to HIV infection. Data on breastfeeding initiation were unavailable for 176, leaving 579 (75.0% of parent study participants) for final analysis (Fig. 1). Characteristics were compared between participants from the parent study who were and were not included in this analysis (Appendix 2, available online at <http://links.lww.com/AOG/D546>). People who were included were more likely to have private insurance and to have hypertensive disorders of pregnancy. No other characteristics varied between those who were included and those who were excluded.

Among those eligible for this analysis, 362 (62.5%) people initiated breastfeeding or provided breast milk to their infants. Demographic and obstetric characteristics were compared between people who initiated breastfeeding and those who did not. People who initiated breastfeeding were more likely to be employed, married, have private insurance, and have at least a high school education and were less likely to have HCV viremia or to use tobacco compared with those who did not breastfeed ($P < .10$; Table 1). Breastfeeding rates also varied by geographic region, with the highest rates in the West and lowest in the Southwest (range 56.1–80.3%, $P = .02$, Table 1). All other characteristics were similar between groups.

Education, employment, and insurance status are all surrogates for socioeconomic status; thus, only one was included in the final model. Insurance status was selected a priori for inclusion because it is more readily available to clinicians in the medical record than employment and education. Characteristics that remained significant in the final model were HCV viremia and insurance status. Specifically, people with HCV viremia at any

point during pregnancy were less likely to initiate breastfeeding compared with those with a sustained undetectable viral load throughout pregnancy (59.4 vs 71.9%; adjusted odds ratio 0.61, 95% CI, 0.41–0.92; Table 2). People with private insurance were more likely to breastfeed than those with public insurance or no insurance (80.0 vs 60.1%; adjusted odds ratio 2.43, 95% CI, 1.31–4.50; Table 2).

Data on breastfeeding duration were available for 211 (58.3%) participants (Table 3). Of those who initiated breastfeeding, the median self-reported duration was 1.4 months (interquartile range 0.5–6.0). Of the 333 people who initiated breastfeeding and completed the 2–6-month follow-up visit, 101 (30.3%) were still breastfeeding. Of the 216 people who breastfed and completed the 18–24-month follow-up visit, 16 (7.4%) were still breastfeeding.

DISCUSSION

We sought to provide detailed information on breastfeeding behaviors and to elucidate factors associated with breastfeeding initiation among people with HCV infection during pregnancy. Although HCV seropositivity is not a contraindication to breastfeeding regardless of viral load, rates of breastfeeding initiation were lower among people with HCV viremia than among those with an undetectable viral load. Tobacco use and socioeconomic measures, including employment, education level, and insurance status, also differed between those who initiated breastfeeding and those who did not. Among people with HCV infection who initiated breastfeeding, duration was short, with a median duration of less than 2 months.

Breastfeeding and provision of breast milk have many known maternal and neonatal benefits, including decreased rates of maternal breast and ovarian cancer, childhood infections, type 2 diabetes, obesity, and decreased infant mortality.¹⁷ Nonetheless, rates of breastfeeding initiation (62.5%) among this cohort of people with HCV infection were lower than the national average of 83.2%.¹⁸ The American Academy of Pediatrics and the World Health Organization recommend exclusive breastfeeding for 6 months after birth and support continued breastfeeding for 2 years or beyond.⁴ In the United States, the overall rate of continued breastfeeding at 6 months is 55.8%.¹⁸ In our study population, only 30.3% of participants reported they were still breastfeeding at the 2–6-month visit. Both the overall rates of initiation and duration of breastfeeding among this cohort of people with HCV infection are lower than among the general U.S. population and fall short of the Healthy People 2030 goals.^{18,19}

Data on breastfeeding rates in this population are scarce. An abstract presented by Espinosa and Nierstrath at the American Academy of Pediatrics meeting in 2021 included retrospective data on 404 infants born to individuals with HCV infection. In this cohort, the rate of breast milk utilization at the time of hospital discharge was only 24.8%. Admission to the neonatal intensive care unit and illicit drug use during pregnancy were associated with lower rates of breastfeeding. However, we found no association of these factors with breastfeeding initiation in our study.

Several of the factors associated with breastfeeding in our study population also have been identified in the general U.S. population. A higher maternal education level has been associated with higher rates of breastfeeding, and tobacco use has been associated with lower rates of breastfeeding.¹⁶ We confirmed that these associations also exist in a population limited to people with HCV infection during pregnancy. We also demonstrated geographic variations in breastfeeding rates in the study population, consistent with regional variation in the general U.S. population.¹⁸

Identification of the association between viremia and lower rates of breastfeeding initiation is a novel finding. Multiple studies have confirmed that breastfeeding is not associated with an increased risk of maternal-to-child transmission, and no definite case of maternal-to-child transmission via breast milk has been reported.^{10,20–23} Despite these robust data, lower rates of breastfeeding among those with viremia may reflect patient and clinician misunderstandings or lingering doubts about risks of maternal-to-child transmission through breastfeeding. Clinician bias and lack of education may play a role in low rates of breastfeeding among people with HCV seropositivity and the even lower breastfeeding rates among those with viremia. In a survey of pediatric physicians, nurse practitioners, and physician assistants, 28.2% incorrectly reported that HCV infection was an absolute contraindication to breastfeeding.²⁴ We are hopeful that by providing data on rates as well as factors associated with breastfeeding in this population, education and interventions can be tailored to increase breastfeeding rates in this group.

Strengths of this study include its inclusion of a large cohort of patients with long-term follow-up data from geographically diverse locations throughout the United States. The parent trial represents the largest cohort of patients with HCV positivity during pregnancy and included prospective collection of detailed information.¹⁴ Use of this data set allowed us to examine multiple factors associated with breastfeeding in detail. However, 25.0% of participants in the original study were excluded due to lack of data on the primary outcome. Participants who were included were more likely to have private insurance and to have hypertensive disorders of pregnancy compared with those who were excluded, which may have affected our findings. The loss-to-follow-up rate from enrollment to the 18–24-month visit in our study population was also high. This study may lack sufficient power to identify some associated factors and interactions between factors can not be fully explored. Factors associated with breastfeeding may overlap with factors associated with HCV viral load. Most participants (77.8%) identified as non-Hispanic White, which is representative of the demographics of the population with a diagnosis of HCV infection in the United States. Participants who were still breastfeeding at the 2–6-month visit and did not complete the 18–24-month visit were excluded from the duration of breastfeeding calculation. Data on income were missing for 76 (13.1%) participants, which may have contributed to the lack of an association between breastfeeding initiation and income, in contrast to other socioeconomic measures. Other limitations include that many factors were based on patient report and, thus, are subject to recall and ascertainment bias.

In conclusion, rates of breastfeeding initiation among people with HCV infection in pregnancy were lower than the national average, and median duration was less than 2 months. Viremia during pregnancy was associated with lower rates of breastfeeding

initiation, likely reflecting lingering biases and misconceptions. Future research should focus on interventions to improve patient and clinician education on the safety and benefits of breastfeeding in this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Supported by grants (HD27915, HD53097, HD40500, HD40544, HD27869, HD40560, HD34208, HD40485, HD87230, HD68258, HD68282, HD40545, HD40512, HD68268, HD34116, HD87192, U24 HD36801) from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

The authors thank Mona Prasad, DO, MPH, Anna Bartholomew RN, BSN, CCRP, Ashley Salazar, RN, MSN, WHNP, Francee Johnson RN, BSN, and Grecio Sandoval, PhD, for protocol development and coordination between clinical research centers; Catherine Y. Spong, MD, for protocol development; Monica Longo, MD, for protocol oversight; and Rebecca Clifton, PhD, and Elizabeth Thom, PhD, (deceased) for protocol development and oversight.

Authors' Data Sharing Statement

Will individual participant data be available (including data dictionaries)? *No*.

What data in particular will be shared? *Not available*.

What other documents will be available? *Not available*.

When will data be available (start and end dates)? *Not applicable*.

By what access criteria will data be shared (including with whom, for what types of analyses, and by what mechanism)? *Not applicable*.

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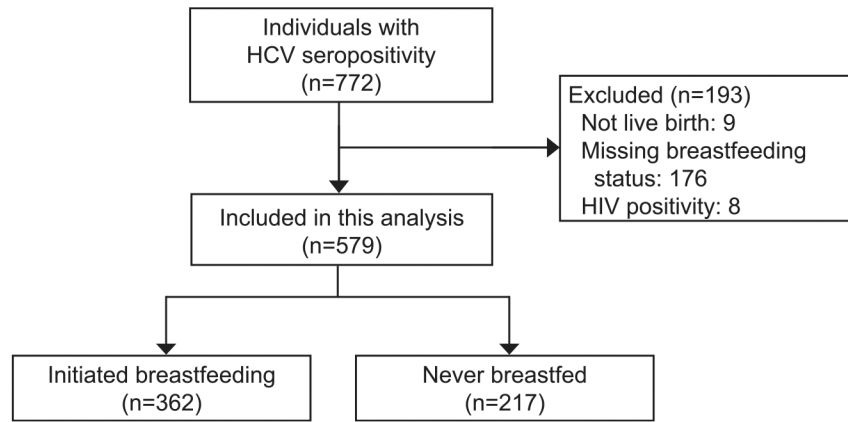


Fig. 1. Participant eligibility and inclusion. HCV, hepatitis C virus; HIV, human immunodeficiency virus. *Grasch. Hepatitis C and Breastfeeding. Obstet Gynecol 2024.*

Table 1.

Participant Characteristics by Breastfeeding Status

Characteristic*	Initiated Breastfeeding (n=362)	Never Breastfed (n=217)	P
Maternal age (y)	2965.1	2965.2	.73
BMI (kg/m ²)	24.9 (21.4–29.4)	24.8 (22.1–29.8)	.44
Non-Hispanic White	284 (78.5)	166 (76.5)	.58
Married or living with partner	166 (45.9)	84 (38.7)	.09
Private insurance	56 (15.5)	14 (6.5)	.001
Less than high school education	191 (52.8)	142 (65.7)	.002
Employed	145 (40.1)	59 (27.2)	.002
Annual income less than \$10,000	146 (46.1)	92 (49.5)	.46
Geographic region			.02
Midwest	113 (31.2)	85 (39.2)	
Northeast	90 (24.9)	57 (26.3)	
Puerto Rico	3 (0.8)	2 (0.9)	
Southeast	84 (23.2)	43 (19.8)	
Southwest	23 (6.4)	18 (8.3)	
West	49 (13.5)	12 (5.5)	
Chronic hypertension	14 (3.9)	13 (6.0)	.24
Hypertensive disorder of pregnancy	46 (12.7)	37 (17.1)	.15
Pregestational diabetes	5 (1.4)	7 (3.2)	.14
Gestational diabetes	19 (5.2)	12 (5.5)	.88
Used during pregnancy			
Tobacco	274 (75.7)	181 (83.4)	.03
Alcohol	51 (14.1)	24 (11.1)	.29
Illicit drugs	217 (59.9)	135 (62.2)	.59
Buprenorphine or methadone	160 (44.2)	91 (41.9)	.59
Hepatitis B or D	7 (1.9)	4 (1.8)	>.99
HCV viremia during pregnancy	252 (69.6)	172 (80.0)	.006
Gestational age at delivery (wk)	38.9 (37.6–39.6)	38.9 (37.1–39.4)	.22
Cesarean delivery	117 (32.3)	82 (37.8)	.18

Characteristic*	Initiated Breastfeeding (n=362)	Never Breastfed (n=217)	P
Hemorrhage at time of delivery	22 (6.1)	16 (7.4)	.54
Preterm delivery before 37 wk	56 (15.5)	45 (20.7)	.11
NICU admission	157 (43.4)	108 (49.8)	.13

BMI, body mass index; HCV, hepatitis C virus; NICU, neonatal intensive care unit;

Data are mean±SD, median (interquartile range), or n (%) unless otherwise specified.

* Missing data: BMI (five patients), education (one patient), income (76 patients), HCV viremia (two patients), hemorrhage (two patients).

Characteristics Associated With Initiation of Breastfeeding Among People With Hepatitis C Virus Infection

Table 2.

Characteristic	OR (95% CI)	Adjusted OR (95% CI), Final Model*
HCV viremia during pregnancy	0.57 (0.38–0.86)	0.61 (0.41–0.92)
Private insurance	2.65 (1.44–4.89)	2.43 (1.31–4.50)
Tobacco use during pregnancy	0.62 (0.40–0.95)	
Married or living with partner	1.34 (0.95–1.89)	
Less than high school education	0.58 (0.41–0.82)	
Employed	1.79 (1.24–2.58)	

OR, odds ratio; HCV, hepatitis C virus.

* Adjusted for the other variable in the final model.

Table 3.

Summary of Breastfeeding Status During Follow-Up Visits

Breastfeeding Status	Value
2–6-mo follow-up visit	
Was the child ever breastfed or given pumped breast milk?	333/531 (62.7)
Is the child still breastfeeding or being given pumped breast milk?	101/333 (30.3)
18–24-mo follow-up visit	
Was the child ever breastfed or given pumped breast milk?	216/379 (57.0)
Is the child still breastfeeding or being given pumped breast milk?	16/216 (7.4)
Initiated breastfeeding (n=211)	
Length of time child breastfed (mo)	1.4 (0.5–6.0)

Data are reported as n/N (%) or median (interquartile range).