

Review

Breastfeeding among Mothers on Opioid Maintenance Treatment: A Literature Review

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Lillian C. Tsai, RN, MS, IBCLC¹ and Therese Jung Doan, RN, PhD²

Abstract

Although there is an abundance of interventional studies to increase breastfeeding rates, little is known about how to support and promote breastfeeding among mothers on opioid maintenance treatment (OMT). The studies on maternal OMT mainly focus on medication excreted in breast milk and breastfeeding benefits for infants with neonatal abstinence syndrome (NAS). We aim to review interventions to improve breastfeeding outcomes among mothers on OMT to make recommendations for practice and future research. We searched CINAHL, PubMed, PsycINFO, and the Cochrane Database of Systematic Reviews for articles, preferably experimental/quasi-experimental studies published within the past 10 years, that examined interventions to increase rates of breastfeeding initiation and duration among mothers on OMT. Nine studies met our inclusion criteria, comprising 5 categories: 4 combined obstetric and addiction care, 1 rooming-in, 1 Baby-Friendly hospital, 2 inpatient/outpatient NAS treatment, and 1 divided methadone dose. Breastfeeding rates were relatively higher for divided methadone dose (81% initiated any breastfeeding) and rooming-in (62% initiated any breastfeeding); lower in Baby-Friendly hospital (24%) and inpatient/outpatient NAS treatment (45% and 24%, respectively); and mixed in combined obstetric and addiction care programs (2 studies reported 70% and 76%; 2 studies reported 17% and 28%). Studies that included both methadone and buprenorphine did not specify breastfeeding results by medication. We recommend future research to differentiate breastfeeding types and duration by OMT medication. Qualitative studies are needed to explore maternal view on breastfeeding regarding need, barrier, and motivating factors in order to develop effective interventions to promote breastfeeding among mothers on OMT.

Keywords

breastfeeding, breastfeeding promotion, breastfeeding rates, chemically-dependent women, drug-exposed infants, drug use, medication, neonatal intensive care unit, substance abuse

Background

Drug addiction among pregnant women has been on the rise in the United States. The results of the 2013 National Survey on Drug Use and Health indicated that 5.4% of all pregnant women were current illicit drug users.¹ Of note, 14.6% of pregnant women ages 15 to 17 years and 8.6% of pregnant women ages 18 to 25 years were current illicit drug users.¹ In particular, there has been a substantial increase in heroin use as well as a rising popularity of both illicit and prescription opioid analgesic medications use.^{2–4} Between 2000 and 2009, maternal opiate use increased nearly 5-fold in the United States.⁵

Among opioid-dependent women who become pregnant, about 9 in 10 pregnancies were unintended.⁶ Perinatal complications for opioid-dependent women and their infants include preeclampsia, third trimester bleeding, malpresentation, preterm labor, low birth weight, fetal distress, meconium aspiration, microcephaly, increased neonatal

mortality, and a 74-fold increase in sudden infant death syndrome.^{7,8} Opioid-dependent women frequently have concomitant polysubstance, alcohol, and tobacco use.⁸ They may also be affected by psychosocial problems such as depression and anxiety, sex work, partner violence, co-addicted partners, and unemployment, and they are often diagnosed with chronic conditions such as hypertension, diabetes, and renal disease.^{8,9}

¹The Birth Center, San Francisco General Hospital and Trauma Center, San Francisco, CA, USA

²School of Nursing, San Francisco State University, San Francisco, CA, USA

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Corresponding Author:

Therese Jung Doan, RN, PhD, School of Nursing, San Francisco State University, 1600 Holloway Avenue, Burk Hall 356, San Francisco, CA 94132, USA.

Email: jungdoan@sfsu.edu

The standard care for opioid-dependent pregnant women is opioid maintenance treatment (OMT) to optimize obstetric care, decrease heroin use, and improve fetal outcomes. The most common opioid agonist pharmacotherapy for OMT is methadone and buprenorphine.⁹ Methadone, a synthetic opioid receptor agonist, was developed in 1937 and was first used in 1965 in methadone maintenance treatment for opioid addiction.¹⁰ Buprenorphine, a semisynthetic opioid receptor agonist, was first used in 1996 as an OMT medication in Europe and subsequently used in the United States in 2002.¹⁰ Both methadone and buprenorphine are transmitted across the placenta and may cross the blood–brain barrier of the fetus.¹⁰ Methadone is usually administered daily at methadone clinic sites, whereas buprenorphine is taken at home.

After birth, the discontinuation of prolonged opiate exposure in utero results in neonatal abstinence syndrome (NAS) for infants of women on OMT. The symptoms of NAS include irritability, hypertonia, tremors, feeding intolerance, emesis, watery stools, seizures, and respiratory distress.⁵ Infants with NAS need medication titration to treat withdrawal symptoms and require intensive care because they are more likely to have respiratory distress, low birth weights, feeding difficulties, and seizures.⁵ With the increase in maternal opioid use, the annual rate of NAS diagnosis among newborns in the United States has increased almost 3-fold in the past decade; in 2009, 1 infant with NAS was born per hour.⁵ Extended pharmacologic therapy and length of hospital stay for infants with NAS cause a great burden on health care costs. Total hospital charges for NAS increased from \$190 million in 2000 to \$720 million in 2009.⁵

Breastfeeding Benefits to Mother and Baby

Breastfeeding has specific advantages for women on OMT and their infants. A mother who breastfeeds is more likely to experience increased bonding and attachment with her baby. This bonding and attachment, along with the hormone release of oxytocin during breastfeeding, may protect the mother against addiction relapse and stress, helping her successful addiction recovery.¹¹ Breastfeeding benefits her infant by either preventing or reducing complications of NAS. As such, the infant may experience lower NAS scores, require less pharmacologic treatment, and have a shorter length of hospital stay.^{12–14}

Despite these benefits to maternal and infant health and well-being, breastfeeding rates are low among mothers on OMT.^{15–18} A diagnosis of NAS often requires separation of baby to the neonatal intensive care unit (NICU), and NAS symptoms such as irritability, hypertonicity, suck and swallow incoordination, nasal stuffiness, and vomiting can make breastfeeding difficult.¹⁹ In addition, health care workers' lack of knowledge about breastfeeding during OMT can result in misinformation and can discourage mothers from breastfeeding.²⁰ Although national rates were unavailable, a survey of Florida hospitals reported that only 3.7% of infants

with NAS were breastfeeding on the day of discharge, and none was exclusively breastfeeding.²¹

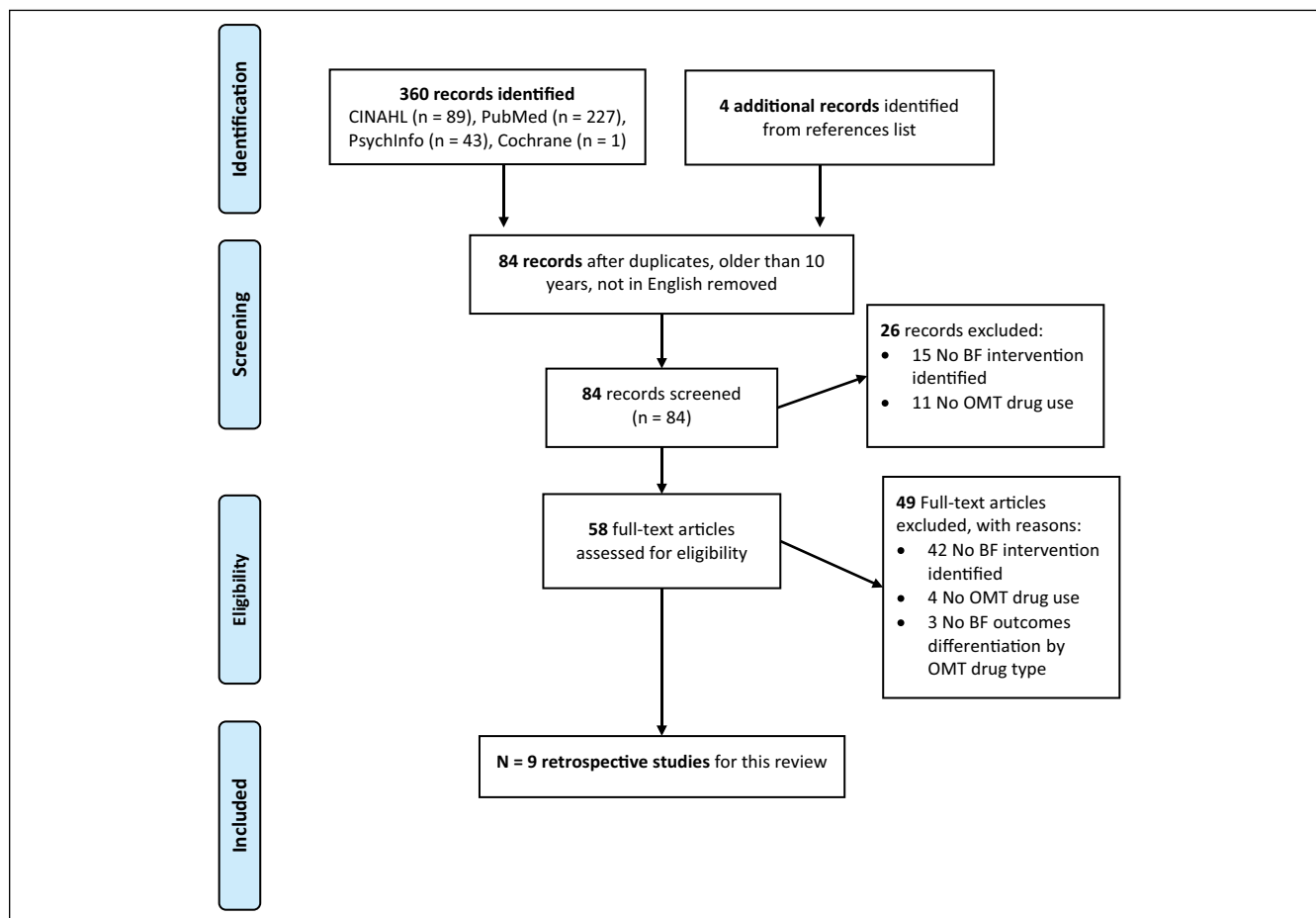
Current Evidence

Current evidence on breastfeeding during OMT focuses on the amount of medication in breast milk and the benefits of breastfeeding to infants with NAS. Although there have been numerous studies exploring interventions to increase breastfeeding in the general population, little is known about how to support and promote breastfeeding among mothers on OMT. A successful intervention to increase breastfeeding among mother–baby pairs on OMT would reduce NAS, promote maternal sobriety, and decrease health care costs. The purpose of this article is to review the literature published in the past decade on breastfeeding interventions aimed at mothers on OMT and to evaluate the effectiveness of these interventions on the breastfeeding outcomes of mothers on OMT.

Methods

We searched the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, PsycINFO, and the Cochrane Database of Systematic Reviews for articles that met our search term criteria. Search terms included *methadone*, *buprenorphine*, *neonatal abstinence syndrome*, *neonatal opioid withdrawal syndrome*, *heroin*, *opioid dependent* or *opioid dependence*, *randomized controlled trial*, *intervention** (any intervention), AND *breastfeeding*. The search was limited to studies in English and to human studies published from January 2005 to October 2015, with preference given to experimental and quasi-experimental studies. The past decade of research is most relevant to the evolution in opioid maintenance treatment for pregnant women, especially for studies on buprenorphine, which was approved in 2002 for use in the United States.¹⁰ We also looked at the reference lists of relevant articles. Abstracts and studies that did not include original data (eg, opinion pieces) were excluded.

We conducted the literature search using the guidelines for Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA).²² To be included, studies must have (1) participants who are pregnant or postpartum on OMT (methadone and/or buprenorphine); (2) an intervention; and (3) breastfeeding outcomes such as breastfeeding initiation, duration, and/or types (any, partial, and exclusive breastfeeding). Studies were also included if the research aims indirectly included breastfeeding outcomes, even if the stated aim of the study was not about breastfeeding. Due to the scarcity of the literature on this subject, we included studies from developed countries with comparable perinatal OMT to that of the United States. We also included any type of intervention, whether control or comparison groups were used. The search resulted in 84 articles and 9 met the inclusion criteria. Although experimental and quasi-experimental were our preferred study designs, no randomized controlled

Figure 1. Search Results Flow Chart.

Abbreviations: BF, breastfeeding; OMT, opioid maintenance treatment.

trials were found in the search. The selected studies consisted of case series, retrospective cohort, and descriptive studies using retrospective chart reviews (see Figure 1).

Results

Table 1 contains a summary of the studies, including study design, data collection time period, type of maternal OMT examined, intervention and comparison or control groups, and breastfeeding outcomes. The studies are organized by 5 categories of intervention: combined obstetric and addiction care, rooming-in, Baby-Friendly hospital, outpatient NAS treatment, and divided methadone dose.

Combined Obstetric and Addiction Care

Some facilities combine obstetric care and addiction treatment.¹⁷ Whereas in some care models, services are provided through 1 central system, other models provided services through multiple interdisciplinary sites. Each model also provided its own range of therapy and social services. To broadly examine all program models that considered addiction

treatment with obstetric care, facilities that specifically addressed addiction treatment with any obstetric care were included, regardless of the size of the program or the scope of services. We included 4 studies that examined the relationship between combined obstetric and addiction care and breastfeeding outcomes among mothers on OMT. Of the 4 studies, 2 were conducted in the United States,^{23,24} 1 in Canada,¹⁷ and 1 in Scotland.¹⁵ The 2 US studies dealt with mothers on buprenorphine, and the Canadian and the Scottish studies examined mothers on methadone. Breastfeeding results were inconsistent among the studies. In the US studies, breastfeeding rates were 76% any breastfeeding initiation, 66% continued any breastfeeding at 6 to 8 weeks,²⁴ 70% any breastfeeding initiation, and 50% continued breastfeeding at 6 to 8 weeks.²³ The Canadian study compared breastfeeding rates from 3 different programs; the findings indicated an average of 17% any breastfeeding and no differences in breastfeeding rates among the program sites.¹⁷ The study from Scotland found 27.7% any breastfeeding initiation with an additional 4.3% of infants receiving expressed breast milk and 11.3% any breastfeeding at discharge.¹⁵ None of the 4 studies reported on breastfeeding types such as partial or exclusive breastfeeding.

Table 1. Summary of Studies (N = 9).

Study (Location)	Sample Characteristics	Design (Time Period of Data Collection)	Intervention and Control or Comparison Groups	Related Interventions	Breastfeeding Outcomes: Rates, Types, Duration
O'Connor et al, 2013 (US–Maine)	N = 85 women who delivered at ≥ 35 weeks gestation	Case series, retrospective chart review (12/2007–08/2012)	Combined obstetric and addiction care; no control or comparison	Baby-Friendly; rooming-in	76% any BF; of those, 66% continued BF at 6–8 weeks
O'Connor et al, 2011 (US–Maine)	N = 22 (23 infants)	Case series, retrospective chart review (08/2007–02/2010)	Combined obstetric and addiction care; no control or comparison	Baby-Friendly; rooming-in	70% BF at discharge; of those, 50% continued at 6–8 weeks
Ordean et al, 2015 (Canada–Vancouver, Toronto, Montreal)	N = 94 pregnant women on OMT from 3 sites: Toronto (n = 36), Vancouver (n = 36), Montreal (n = 22) infants delivered at ~ 38 weeks GA	Descriptive, retrospective chart review (1997–2009)	Combined obstetric and addiction care; comparison among 3 hospitals	Baby-Friendly (only Toronto); rooming-in	16.9% any BF (all sites); unspecified type or duration. No differences in BF rates among the 3 sites.
Dryden et al, 2009 (UK–Glasgow, Scotland)	N = 437 women followed from pregnancy through postpartum period and their infants delivered at term (37.8 ± 2.5 weeks GA)	Retrospective cohort study (01/2004–12/2006)	Combined obstetric and addiction care; no control or comparison	Formerly Baby-Friendly accredited; rooming-in encouraged	27.7%; any BF initiation, + 4.3% expressed breast milk. 11.3% any BF at discharge.
Abrahams et al, 2007 (Canada–Vancouver, Surrey)	N = 106 mothers and infants with NAS. Rooming-in (n = 32, delivered 10/2001–12/2002); historical control (n = 38, delivered in the same hospital, 01/1999–09/2001); and comparison control (n = 36, delivered 01/1999–12/2002 at another hospital).	Retrospective cohort study (01/1999–12/2002)	Rooming-in vs no rooming-in for historical control and comparison control delivered at a different hospital	Baby-Friendly	62.5% any BF for rooming-in intervention. 7.9% any BF for historical cohort. 11.1% any BF for comparison.

(continued)

Table 1. (continued)

Study (Location)	Sample Characteristics	Design (Time Period of Data Collection)	OMT	Intervention and Control or Comparison Groups	Related Interventions	Breastfeeding Outcomes: Rates, Types, Duration
Wachman et al, 2010 (US—Massachusetts)	N = 276 mother–infant pairs; infants delivered ≥ 35 weeks GA. Mothers on OMT with MTD (92%, n = 254) and BUP (8%, n = 22).	Descriptive, retrospective chart review (07/2003–01/2009)	MTD 92%; BUP 8%	Baby-Friendly; no control or comparison	None	24.1% any BF; mean 5.9 $\pm$ 6.5 days before cessation. Results not differentiated by OMT medication.
Smirk et al, 2014 (Australia—Melbourne)	N = 118; home (n = 38); inpatient (n = 80)	Descriptive, retrospective chart review (01/2004–12/2010)	108 of 118 on OMT; MTD 79%; BUP 21%	Outpatient NAS treatment compared to inpatient control group	Baby-Friendly	At discharge, 45% outpatient vs 22% inpatient; unspecified type or duration
Backes et al, 2012 (US—Ohio)	N = 121 infants born between 34 and 40 weeks GA, received MTD for NAS treatment; traditional group (n = 75) and combined inpatient/outpatient group (n = 46)	Descriptive, correlational retrospective chart review (01/2007–01/2009)	MTD	Combined inpatient/outpatient NAS treatment compared to inpatient control group	None	24% combined group vs 8% inpatient BF at discharge; unspecified type or duration
McCarthy et al, 2015 (US—California)	N = 62 mother–infant dyads; infants delivered 23–42 weeks GA	Descriptive, retrospective chart review (06/2008–01/2013)	MTD	Mothers got 2–6 divided doses of methadone per day; no comparison or control group	None	81% any BF; unspecified type or duration

Abbreviations: BF, breastfeeding; BUP, buprenorphine; GA, gestational age; MTD, methadone; NAS, neonatal abstinence syndrome; OMT, opioid maintenance treatment; UK, United Kingdom; US, United States of America.

Rooming-in

One study looked at the effect of rooming-in on breastfeeding for mothers on OMT. Rooming-in is the practice of caring for the mother and baby together in the same room as much as possible after birth,²⁵ where postpartum care and infant care are performed in the room instead of bringing the baby to the nursery for infant care. The intervention group consisted of 32 women admitted from October 2001 to December 2002 who were rooming-in with their infants after delivery.²⁶ The control groups included (1) a historical cohort of 38 mothers who gave birth from January 1999 to September 2001 in the same hospital as the 32 women in the intervention group but before rooming-in was available, and (2) a concurrent cohort of 36 mothers who delivered from January 1999 to December 2002 at another hospital where rooming-in was not available. The authors found that 62.5% (n = 20) of the rooming-in group initiated breastfeeding, compared to 7.9% (n = 3) of the historical cohort and 11.1% (n = 4) of the concurrent cohort.²⁶ Breastfeeding duration and exclusivity were not noted in this study.

Baby-Friendly Hospital

One retrospective chart review examined the effect of a Baby-Friendly hospital on breastfeeding outcomes of newborns with NAS.¹⁸ The infants in this study were in the inpatient pediatric unit after the mothers were discharged. Although rooming-in is step 7 of the *Ten Steps to Successful Breastfeeding*,²⁷ rooming-in, as an intervention, was not reported. It was unknown whether mothers were allowed to stay in the boarding area during infant hospitalization. Medical records were reviewed for 276 OMT mothers, of which 254 (92.0%) were on methadone, 22 (8.0%) were on buprenorphine, and 187 (67.8%) were eligible to breastfeed. Of the 187 mothers eligible to breastfeed, only 45 women (24.1%) initiated breastfeeding, with a mean number of 5.9 ± 6.5 days before cessation. Although the participants were categorized by type of OMT, results were not differentiated according to methadone or buprenorphine, and breastfeeding duration and exclusivity were not noted.¹⁸

Outpatient NAS Treatment

At most hospitals, NAS treatment of newborns takes place over several weeks in the NICU. This can mean that mother and baby are separated within the hospital while the mother is recovering from delivery but also separated by great distance if the mother is discharged home. Although many hospitals offer mothers an option to “board” in the hospital for the infant’s NICU stay, not all mothers are able to take advantage of this if they have other children to care for at home. Outpatient/home-based treatment of NAS allows mothers and babies to remain together, encouraging

skin-to-skin contact and breastfeeding. In a survey of 383 NICUs in the United States, only 34% reported offering home treatment programs.²⁸ We found 2 studies—1 conducted in Australia²⁹ and 1 in the United States³⁰—that explored the effect of outpatient/home-based NAS treatment on breastfeeding outcomes.

In the Australian study, the intervention group (n = 38) received a home-based detoxification program that included a week’s worth of medication for the infant, alternate day home visits and phone calls from nurses, and weekly assessments with a neonatologist.²⁹ The control group (n = 80) received NAS treatment in the hospital. There were 108 mothers on OMT—79% methadone and 21% buprenorphine. Polysubstance use occurred in 67 mothers, but results were not differentiated by substance use or OMT. Therefore, breastfeeding rates included 10 participants who were not on OMT. In the home-based intervention group, breastfeeding results were clearly documented for 33 of the mothers, and of those, 45% (n = 15) were breastfeeding at discharge. In the inpatient group, 22% (n = 18) were breastfeeding at discharge. The findings indicated no statistically significant differences in breastfeeding outcomes between the groups, and results were not differentiated according to methadone or buprenorphine.²⁹ Breastfeeding duration and exclusivity were not noted in this study.

In the US study, the intervention group received a combined inpatient/outpatient treatment for NAS (n = 46) and the control group received only inpatient treatment (n = 75).³⁰ In the intervention group, the methadone treatment was initiated in the inpatient setting but completed in the outpatient setting. At home, families received 3 days’ worth of methadone for the infant, had 24-hour access to their physician, and attended a dedicated clinic for infant evaluation every 3 days. There were significant differences ($P < .01$) in breastfeeding outcomes between the groups, as 24% (n = 11) of the intervention group was breastfeeding compared to 8% (n = 6) of the control group.³⁰ Breastfeeding duration and exclusivity were not noted in this study.

Divided Dose of Methadone

Methadone maintenance is most commonly given as a single daily dose. But the accelerated metabolism of methadone during pregnancy may cause mother and baby to experience faster onset and more severe symptoms of withdrawal and NAS. During pregnancy, divided doses of methadone have shown decreased neurobehavioral suppression in fetuses.³¹ In a study of 62 infants delivered at 23 to 42 weeks gestation, researchers examined the effect of dividing methadone doses on breastfeeding outcomes.³² Mothers of these infants were treated on 2 to 6 divided doses of methadone per day. The authors reported that 81% of the infants breastfed without elaborating on duration or exclusivity of breastfeeding. No control group or comparison group was presented.³²

Discussion

Of the studies' results, 1 of the most effective interventions to promote breastfeeding among mothers on OMT was rooming-in.²⁶ In the cohort study, breastfeeding rates were reported to be 62.5% in the rooming-in group compared to 7.9% for the historical cohort and 11.1% for the concurrent cohort.²⁶ The findings concur with results of a more recent study on breastfeeding promotion for management of NAS.³⁴

The results were mixed for the 4 studies using the combined obstetric and addiction care model. Two studies reported low breastfeeding rates of 16.9%¹⁷ and 27.7%,¹⁵ whereas 2 studies reported higher breastfeeding rates of 77%²⁴ and 70%.²³ This difference might be explained because of medication type (in the studies with higher breastfeeding rates, the mothers were on buprenorphine; in the studies with lower breastfeeding rates, the mothers were on methadone). None of the combined obstetric and addiction care studies detailed what breastfeeding support or information, if any, was given to the patients, which was a limitation of these studies. It is interesting that the 2 studies with higher breastfeeding rates took place at Maine General Medical Center, a designated Baby-Friendly hospital where rooming-in is part of breastfeeding support.²⁷

Interventions resulting in low breastfeeding rates for mothers on OMT included the Baby-Friendly hospital intervention (24.1%)¹⁸ and outpatient NAS treatment intervention (45% and 24%).^{29,30} The Baby-Friendly hospital study was the only study that examined date of breastfeeding cessation; the authors found that 66% of mothers who initiated breastfeeding stopped after an average of 5.88 days.¹⁸ Therefore, mothers on OMT not only need support and education to initiate breastfeeding, but they also need continued assistance to breastfeed long term.

Although the outpatient interventions showed low breastfeeding rates, it is important to note that both studies demonstrated higher breastfeeding rates in the intervention groups than the inpatient comparison groups, with 1 study demonstrating a 3-fold significant difference.³⁰ The *Ten Steps to Successful Breastfeeding*²⁷ implemented in Baby-Friendly hospitals do not automatically improve breastfeeding among mothers on OMT because these women require interventions specifically tailored to their needs. For example, results from a qualitative study revealed crucial information on the obstacles to breastfeeding that mothers on OMT face.³⁵ This study identified an insecurity that is specific to mothers on OMT, where the women expressed guilt over having methadone in their breast milk, even though the medication allowed them to overcome addiction. Another common theme from the interviews was lack of support from health care staff. The women felt especially judged and discouraged from breastfeeding by postpartum nurses. The interviews demonstrated the importance of accurate information and encouragement to the decision-making process of mothers on OMT.³⁵

Overall, all of the interventions, except for the divided methadone dose study,³² resulted in breastfeeding rates lower than the US national average of 79.2% for any breastfeeding.³⁶ The study findings suggested that receiving divided methadone doses, instead of a single daily dose, helped both mother and baby experience fewer withdrawal symptoms. This can enhance the mother's sense of bonding and attachment, decrease her frustration, and improve baby's latch and suck coordination. All of this could contribute to better breastfeeding success.

Limitations of Studies

Four of the 9 studies were conducted in other countries, and thus, the findings of these studies had limited generalizability to the US population. In addition, the descriptive and correlational designs of the studies resulted in several biases. Lack of a control group of women not on OMT resulted in a selection bias that weakened the study results. It was also not possible to examine breastfeeding outcomes related solely to OMT because of confounding psychosocial factors such as maternal mental status, support system or lack of, and concurrent polysubstance use (eg, cocaine, heroin, benzodiazepines, and marijuana) among mothers on OMT. Findings on breastfeeding outcomes were not differentiated by quantity, duration, or exclusivity.

Two studies included both mothers on methadone and mothers on buprenorphine,^{18,29} but neither study differentiated breastfeeding results by OMT. Also, none of the studies directly compared methadone and buprenorphine when there are differences between the 2 medications that can influence breastfeeding outcomes. The administration of methadone by daily clinic visit can be inconvenient compared to an at-home prescription of buprenorphine, making breastfeeding more challenging. Data have shown that the incidence and severity of NAS are greater in infants exposed to methadone than heroin, and preliminary research has shown that buprenorphine results in shorter length of hospital stay, shorter duration of pharmacologic treatment, and lower amount of morphine treatment compared to methadone.³³ Any difference in severity of NAS would influence breastfeeding outcomes, since infants with NAS are more likely to have feeding difficulties.⁵

Since mothers on OMT are a small but growing population, 5 of the 9 studies had small sample sizes, which may explain their lack of statistically significant results.^{17,24,26,29,32} Two studies included participants in their samples who were ineligible to breastfeed (HIV status, fetal anomalies, neonatal demise).^{15,26} In addition, some studies occurred in facilities with Baby-Friendly designation, either concurrent with the duration of the study^{17,23,24,26} or previous to the study.¹⁵ The breastfeeding outcomes of those studies could not be solely attributed to the individual study's intervention; rather, those results may be influenced by the steps to successful breastfeeding²⁷ taken by Baby-Friendly hospitals, including rooming-in, another intervention that we examined. These

overlapping interventions make it difficult to state conclusively which interventions were more successful, and perhaps their breastfeeding outcomes were the result of the specific combination of these interventions.

Another limitation to these studies was that none provided details about when the mothers initiated OMT, whether during pregnancy, right before pregnancy, or years before pregnancy. A mother who has been on long-term OMT with a stable, healthy lifestyle may have very different breastfeeding support needs compared to a mother who is newly on OMT and who has used illicit opiates during her pregnancy.

Finally, because we did not find any experimental studies or any with randomization of grouping, the findings herein suggest more of an association rather than a cause-and-effect relationship between the interventions employed by the studies and breastfeeding outcomes.

Recommendations

Mothers on OMT are encouraged and advised to breastfeed their infants regardless of maternal OMT dose and when there are no contraindications to breastfeeding.³⁷⁻³⁹ Interventions that kept mothers and babies together were the most successful, as were interventions that specifically targeted the aspect of addiction and medication unique to mothers on OMT, such as combined obstetric and addiction care programs and divided methadone dosing. Implications for health care workers include their role in breastfeeding education and promotion, as well as awareness of bias toward mothers on OMT. Future research should include a wider variety of breastfeeding interventions, since this review discovered only 5 types of interventions. Randomized controlled trials, with larger sample sizes in different settings, could be used to further test the efficacies of the interventions found through this review. It is also important to examine if different kinds of interventions produce different results for breastfeeding initiation, duration, and exclusivity. We recommend more research examining the effect of methadone versus buprenorphine treatment for improving breastfeeding outcomes, as well as studies that differentiate data based on when OMT was initiated in relation to a woman's pregnancy.

Conclusion

We intended to identify interventions aimed at mothers on OMT that may improve breastfeeding outcomes. Overall, the literature is sparse on breastfeeding interventions for mothers on OMT. Future research is needed to validate the effectiveness of the interventions found in our review. The most successful breastfeeding interventions for this group were those tailored specifically to the unique needs of mothers on OMT. With maternal opiate use on the rise, hospitals and clinics will see more and more mothers already on OMT or mothers currently on illicit opiates wanting to get on OMT. As this

happens, hospitals will see a corresponding increase in infants with NAS. Therefore, it is imperative that hospitals and health care providers seek out all avenues that may support addiction recovery and improve infant outcomes. Breastfeeding during OMT is a cost-effective intervention that benefits the health of the infant as well as the sobriety and attachment of the mother and reduces the cost burden of hospitals. We recommend future research to explore the maternal view on breastfeeding related to needs, barriers, and motivating factors in order to develop and implement effective interventions to promote breastfeeding among mothers on OMT.

Declaration of Conflicting Interests

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