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Investigating the Duration of Exclusive Breastfeeding, the Challenges Ahead, and Methods of Extending the Lactation Period in Drug-Addicted Mothers: A Review Study

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Abstract

Objectives: The prevalence of drug abuse among pregnant women is increasing worldwide, putting their infants at the risk of many disorders. Neonatal abstinence syndrome (NAS) is considered as a neurological disorder in infants who are exposed to narcotics during pregnancy. Breastfeeding is implicated to markedly reduce the incidence and severity of the NAS, as well as the need for therapeutic agents. Therefore, the present study aimed to investigate the duration of exclusive breastfeeding and the hospital stay of infants with NAS, as well as the challenges ahead and solutions to extend the lactation period in drug-addicted mothers.

Methods: A number of review articles indexed in PubMed, Google Scholar, and Medline databases were scrutinized in this study. The chosen review articles surveyed experimental/quasi-experimental studies that were published during 2004-2018 using keywords including NAS, drug-addicted mothers, exclusive breastfeeding barriers, and continued breastfeeding.

Results: According to the results, the duration of continued breastfeeding in drug-addicted women was short and it failed in the first six months after delivery. The critical factors interfering with continued breastfeeding were categorized into individual, family, and social barriers. In addition, social barriers consisted of fear and misconception about lactation, the lack of awareness and motivation, along with the lack of family support and health care centers. The findings suggest that mother's training during the pregnancy, mother-infant rooming-in, and mother-infant skin-to-skin contact could be potentially applied to extend the duration of the lactation in drug-addicted pregnant women.

Conclusions: In general, hospitals should provide a comfortable environment to encourage drug-addicted women to breastfeed infants with the NAS. It seems that providing resources and facilities where drug-addicted women could discuss barriers to breastfeeding, as well as gaining access to lactation counselors and other professional practitioners would help mothers to continue breastfeeding.

Keywords: Neonatal abstinence syndrome, Drug-addicted mothers, Exclusive breastfeeding, Continued breastfeeding, Breastfeeding barrier

Introduction

The rate of drug abuse has markedly increased among pregnant women in recent years. Based on the reports declared by the National Survey on Drug Use and Health (2013), approximately 5.4% of pregnant women use illegal drugs during gestational periods (1). Although there are no definite statistical reports about the number of drug-addicted women who live in Iran, some sporadic epidemiological investigations predict that 9.6% of Iranian drug-abusers are women (2). Based on the reports of an Iranian epidemiological study, drug-addicted mothers consumed raw opium (53.7%), opium sap (22%), raw opium/opium sap mixture (4.9%), methadone (4.9%), crystal (9.7%), and crack (4.8%) (3). Drug abuse disorders cause erratic behaviors and conditions that could endanger newly-born infants regardless of fetal exposure to drugs and mothers with drug abuse may have coexisting risk factors such as low socioeconomic status (although substance abuse weakens the socioeconomic position of drug abusers), little educational background, poor nutritional status, and the lack of adequate parental care (4). The standard protocol for the treatment of opioid-dependent pregnant women is opioid maintenance treatment (OMT) which takes into account the optimization of obstetric care, the reduction of heroin use, and improvement of fetal outcomes. Methadone and buprenorphine are considered as the most common opioid agonists in the OMT protocol (5). In the postpartum period, the cessation of sustained opiate exposure in uterus results in the development of the neonatal abstinence syndrome (NAS) in infants of women on the OMT. The clinical manifestations of the NAS include hypertonia, irritability, feeding intolerance,

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tremors, vomiting, seizure, watery stools, and respiratory distress (6-9). Breastfeeding is one of the essential non-pharmacological interventions that could reduce the symptoms of malnutrition in neonates with nutrition deprivation (10). Although breastfeeding is highly recommended for mothers afflicted with drug addiction, the initiation and continuation of exclusive breastfeeding are reportedly very low and the rate of breastfeeding in these mothers falls within the below average range (11,12). Therefore, it is necessary for drug-addicted mothers to be familiar with the significance of breastfeeding, along with some misconceptions about the process of breastfeeding, which would help them to keep on exclusive breastfeeding (13,14). Thus, the present aimed to evaluate the duration of the lactation and the potential barriers to exclusive breastfeeding in opioid-dependent mothers. The current review article assessed the available online therapeutic approaches which were thought to extend the duration of the breastfeeding in drug-dependent mothers.

Methods

The current review article attempted to scrutinize the literature indexed in top-ranked databases including PubMed, Google Scholar, and Medline using different keywords such as "neonatal abstinence syndrome", "drug-addicted mothers", "heroin, methadone", "buprenorphine", "breastfeeding", "drug-related disorders", "exclusive breastfeeding barriers", and "continued breastfeeding". The search period was confined to English and Persian articles that were published between January 2004 and October 2018. In addition, the study focused on those review articles that addressed the experimental/quasi-experimental studies. A total of 68 articles were finally found in which 11 papers met the required criteria and were used in our study. The criteria for choosing such papers included the benefits of breastfeeding for mother and suckling child concerning the recommended guidelines, exclusive breastfeeding in drug-addicted mothers consuming opioids, methadone, buprenorphine, and heroin, along with the barriers to exclusive breastfeeding. The other required criteria were the results of breastfeeding in drug-addicted women such as the initiation, duration, and types (i.e., ever, partial, and exclusive breastfeeding), and the solutions to extend the duration of breastfeeding. Irrespective of the aim of research studies, they were included in our study upon the presence of reports on breastfeeding outcomes. Due to the limited number of published research on this subject, the current review research included studies from developed countries with comparable perinatal OMT to that of the United States. The selected investigations consisted of case series, retrospective cohort, and descriptive studies (Figure 1).

Results

The Benefits of Breastfeeding to Mother and Suckling Child According to the Recommended Guidelines

Exclusive breastfeeding significantly improves the health status of infants while it decreases the risk of infectious diseases, pediatric metabolic disorders, and infant mortality (15-18). Further, breastfeeding has remarkable benefits for both drug-addicted mothers, who are under maintenance treatment, and their infants. Mothers who breastfeed their infants have stronger emotional and attachment relationships with their infants compared with mothers who are not willing to breastfeed their infants. This emotional attachment, along with the increased release

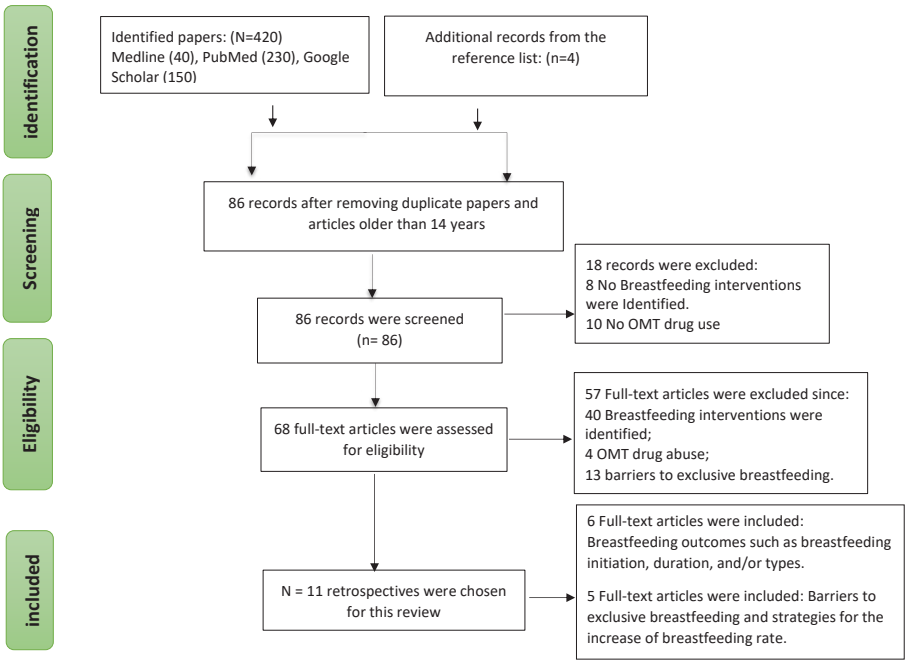

Figure 1. Results of Web Browsing Depicted in a Flow Chart.

of oxytocin hormone during breastfeeding may protect mothers against stress and addiction habits, advising mothers to not return to addition (19). Furthermore, the prevention or reduction of NAS complications is considered as one of the advantages of breastfeeding to infants (11). The NAS is basically diagnosed when an infant has a history of prenatal exposure to psychoactive substances or the clinical symptoms of drug withdrawal. The Finnegan scoring system is one of the most common tools which is employed to assess the severity of NAS (Table 1). The evaluation is regularly carried out every 3 to 4 hours to monitor the severity of neurologic excitability, gastrointestinal dysfunction, autonomic instability, and respiratory distress. The interventional management is warranted when the Finnegan score is greater or equal to 8 although the protocols used for the treatment of NAS are quite different among the hospitals (20). Accordingly, infants with lower Finnegan score require less interventional treatment and shorter hospitalization period (11).

According to the reports of the American Academy of Pediatrics (AAP) and American Academy of Family Physician, exclusive breastfeeding during the early 6 months of birth, along with one-year feeding with solid foods is highly recommended for mothers with drug abuse unless different complications are observed in pregnant mothers, including maternal human immunodeficiency virus, radiation therapy, chemotherapy, and illegal drug/poly-drug abuse such as amphetamines, cocaine, marijuana, alcohol, as well as other industrial and synthetic substances (21). Accordingly, breastfeeding is forbidden for mothers who are on the OMT because breast milk contains some levels of opioids which are harmful to infants (22). It is now known that only low concentrations of methadone are excreted into the breast milk within the range of 21-462 ng/mL in a dose-independent manner (23,24). Thus, all opioid-dependent women who are on the OMT must be encouraged to breastfeed their infants unless they consume illegal drugs (17). The guidelines introduced by the AAP in 2001, which were reaffirmed in 2015, lifted the embargo of breastfeeding for all doses of methadone (17-19,21,25). At present, research has revealed that the concentrations of opioids in the breast milk of mothers who receive OMT are negligible. Moreover, cigarette smoking by the mothers should be avoided as it is associated with an increase in the prevalence of infantile respiratory allergies and sudden infant death syndrome (26).

Table 1. Finnegan Score

Systems	Signs and Symptoms	Score
Central nervous system disturbances	Excessive high-pitched cry <5 minutes	2
	Continuous high-pitched cry >5 minutes	3
	Sleeps <1 hour after feeding	3
	Sleeps <2 hours after feeding	2
	Sleeps <3 hours after feeding	1
	Hyperactive Moro reflex	1
	Markedly hyperactive Moro reflex	2
	Mild tremors when disturbed	1
	Moderate to severe tremors when disturbed	2
	Mild tremors when undisturbed	1
	Moderate to severe tremors when undisturbed	2
	Increased muscle tone	1-2
	Excoriation (i.e., chin, knees, elbow, toes, and nose)	1
	Myoclonic jerks (twitching/jerking of limbs)	3
	Generalized convulsions	5
Metabolic vasomotor/respiratory disturbances	Hyperthermia ≥ 37.2°C (99°F)	1
	Frequent yawning (≥4 in an interval)	1
	Sweating	1
	Nasal stuffiness	1
	Sneezing (≥3-4 times/scoring interval)	1
	Respiratory rate >60/minutes	1
	Tachypnea (rate >60/minutes with retractions)	2
Gastrointestinal disturbances	Poor feeding (infrequent/uncoordinated suck)	2
	Vomiting (or regurgitation) ≥ 2 times during/post feeding	2
	Loose stools (curds/seedy appearance)	2
	Watery stools (water ring on nappy around stool)	3
	90% of birth weight	2
	Excessive irritability	1-3

Note. The Finnegan score evaluates the clinical symptoms which are frequently observed in infants exposed to the opiate. The method of ranking is performed every 3 to 4 hours after the infant's birth. In most institutions, 3 repeated scores ≥ 8 results in the initiation of therapy for drug withdrawal. However, the thresholds for treatment may differ among institutions and treatment protocols are not standardized.

Evaluation of the Duration of Exclusive Breastfeeding in Drug-Dependent Mothers

Six studies were reviewed considering the duration of exclusive breastfeeding in drug-addicted mothers. One of these 6 investigations was performed in Iran by Javan et al. in which 81 pregnant women were enrolled and followed up for 2 years. Pregnant women were assigned into 2 groups including drug-dependent women (41 individuals) and those with no history of drug abuse (40 individuals). Among women afflicted with drug abuse, 6 addicted women consuming crack crystals were removed since they were banned from breastfeeding. Based on researchers' reports, exclusive breastfeeding lasted for 2 months in 42.9% of drug-addicted women while 34.3% of drug-dependent women could breastfeed their infants for 4 months (exclusive breastfeeding). Javan et al indicated that 53.7%, 22%, 4.9%, 4.9%, 9.7%, and 4.8% of mothers used raw opium, opium sap, a mixture of raw opium and opium sap, methadone, crystal, and crack, respectively. They also demonstrated that the status of exclusive breastfeeding was not satisfactory in women with a history of drug abuse as only 31.4% of drug-dependent women were could breastfeed for a maximum 6 months (3).

In their retrospective study, O'Connor et al followed up opioid-dependent pregnant women between December 2007 and August 2012 and reported that 76% of opioid-dependent pregnant women preferred to breastfeed their newly born neonates after delivery. Among these mothers with drug abuse, 10% of them initiated breastfeeding in the hospital and the remaining cases were capable of breastfeeding 6-8 weeks postpartum (27).

Similarly, Welle-Strand et al carried out a national cohort study in which 124 Norwegian women were treated with either methadone or buprenorphine during pregnancy and their infants were born between 1999 and 2009. Based on their results, the frequency of breastfeeding at 4, 8, 12, 26, and 52 weeks of infant age was 58.56%, 53.39%, 46.34%, 21.15%, and 7.5% for women in methadone maintenance treatment (MMT) and buprenorphine maintenance treatment (BMT), respectively. Additionally, the average age of breastfeeding was twelve and 7 weeks for women on the MMT and BMT, respectively (28).

In addition, Dryden et al assessed a cohort study of infants born to substance-addicted mothers prescribed substitute methadone in gestation. All members of the case group delivered their infants over the 3 years between 1 January 2004 and 31 December 2006. Subsequently, 72 newly born neonates (20.3%) received breast milk at early (72 hours) or later time points after the birth while half of them received supplementary foods with infant formula as well. At the time of discharge, about one-third of supplemented breastfed infants were breastfed in comparison to all the infants (22 individuals) exclusively breastfed at the first 72 hours after birth (29).

Likewise, Wachman et al performed a retrospective study on newly born neonates with NAS who were born at Boston Medical Center between July 2003 and January 2009. The eligibility criterion was the gestational age of more than 35 weeks. They indicated that newly born infants could be transferred from the neonatal intensive care (NICU) into the inpatients unit when drug-addicted women were discharged from the maternity service. In addition, mothers with substance abuse were prescribed methadone or buprenorphine during the pregnancy period. Totally, 276 mother-infant pairs were recruited among whom, 40% of mothers suffered from one or more psychiatric disorders. Further, 24% of mothers were taking 2 or more psychiatric medications. Based on the obtained data, 68% of mothers met the required criteria to breastfeed among whom, 24% were successful in breastfeeding their infants during the hospital stay while 60% of them decided not to continue breastfeeding after about 5.88± 6.51 days. The researchers reported a low rate of breastfeeding among opioid-dependent mothers as 75% of them preferred not to breastfeed anymore. The remaining women, who decided to continue breastfeeding, finally preferred to stop breastfeeding within the following 7 days (12).

In another retrospective investigation from 1 January 2004 to 31 December 2006, Dryden et al included 450 women with singleton pregnancies who were afflicted with substance abuse while they received methadone maintenance therapy. Based on the reports, breastfeeding was commenced in 27.7% of neonates while a further 19 infants were fed with the mother's own expressed breast milk. Further, Dryden et al demonstrated that 11.3% of neonates were still breastfeeding, at least to some extent, at the time of discharge (30) (Table 2).

The Assessment of Barriers to the Initiation and Continuation of Breastfeeding in Drug-addicted Mothers (Table 3)

Individual Issues

Individual circumstances include issues related to the mothers and their infants which are elucidated in detail as follows:

Maternal Issues

Concerns and Misconceptions About Breastfeeding

In a study conducted by Demirci et al, 7 pregnant women, along with 4 postpartum women receiving methadone maintenance therapy were evaluated, and they shared their experiences about breastfeeding. The concerns of pregnant and postpartum women included worry about the transfer of hepatitis C through the breast milk, the lack of enough time to devote themselves to breastfeeding as a result of other responsibilities and care-taking of children, concerns about having enough volume of breast milk or the process of "dry up", worry about their infants with latching-on problems, and anxiety about the fact that their infants might overdose or become "high" on methadone which could convey through breast milk

Table 2. Evaluation of the Duration of Exclusive Breastfeeding in Drug-dependent Mothers

Study/Year/ Location	Type of Study	Sample Size	Opioids	Results of Breastfeeding: Percentage and Duration
Javan et al (3), Iran	Prospective cohort study	85 pregnant women: 41 drug-dependent women and 44 healthy individuals	53.7% raw opium, 22% opium sap, 4.9% a mixture of raw opium and opium sap, 4.9% methadone	42.9% continued breastfeeding up to 8 weeks, 34.3% continued breastfeeding up to 16 weeks, 31.4% continued breastfeeding up to 24 weeks
O'Connor et al (27), USA	xxx	N = 85 women Pregnancy age ≥ 35	Buprenorphine	76% ever breastfeedings from which, 66% continued breastfeeding up to 6-8 weeks
Welle-Strand et al (28), Norway	xxx	124 pregnant mothers	Methadone or buprenorphine	58.56% continued breastfeeding up to 4 weeks, 53.33% continued breastfeeding up to 8 weeks, 46.34% continued breastfeeding up to 12 weeks, 21.15% continued breastfeeding up to 26 weeks, 7.5% continued breastfeeding up to 52 weeks
Dryden et al (29), Scotland	xxx	N = 354 term infants	Methadone	72 infants (20.3%) were breastfed at first 72 hours of birth
Wachman et al (12), USA	xxx	N = 286 infant-mother pairs	Methadone 92%, Buprenorphine 8%	68% of mothers met the criteria for breastfeeding, among them, 24% cases breastfed their infants during their hospitalization and 61% of women who started to breastfeed preferred to stop breastfeeding after about 5.88 days.
Dryden et al (30), Scotland	xxx	N= 451 postpartum women	Methadone	27.7% just started breastfeeding; Only 4.3% of infants were breastfed until the time of discharge; 11.3% of infants consume no breast milk at the time of discharge.

Note. Barriers to the initiation and continuation of breastfeeding in drug-dependent mothers and barriers to the initiation and continuance of breastfeeding in opioid-dependent mothers are categorized as individual, family, and social barriers.

Table 3. The Assessment of Barriers to the Initiation and Continuation of Breastfeeding in Drug-addicted Mothers

Type of Barrier	Target Individual(s)	Influencing Factors
Individual	Mother	**A: Concerns and misconceptions:** Concerning about hepatitis C transmission through the breast milk/anxiety about the lack of enough time for breastfeeding due to household chores and care-taking of the children/worrying about the "dry up" process which occur in the breasts/ concerning about the potential problems or probable signs of NAS/worrying about the overdose of infants (31); **B: Lack of knowledge:** The paucity of knowledge about breastfeeding guidelines for mothers who are under OMT (32).
		C: Dearth of motivation: The absence of confidence in mothers, as well as the feeling of being guilty (32)/unwillingness of mother to breastfeed due to the addiction (33)/frustration of mothers about infant problems with latching on and sucking/mother's disappointment in the effective breastfeeding (31); **D: Miscellaneous factors:** Family-social problems and mental-psychological disorders in drug-addicted mothers /low milk production (3).
	Infant	**Signs of withdrawal syndrome** such as irritability, hypertonicity, incompatible sucking, nasal stuffiness, and vomiting (34).
Family	Spouse and other family members (grandfather, grandmother, and the like.)	Fears and concerns of the spouse about breastfeeding/the lack of family support for breastfeeding (31).
Social	Health staff members (physician, midwife, and nurse)	Mother-infant isolation during infant hospitalization in NICU/the lack of mothers' training according to the National Guidelines for breastfeeding in drug-addicted mothers (33)/the lack of knowledge of health care workers about breastfeeding during maintenance treatment (11)/the lack of support by nurses to breastfeed the infant (31).

Note. NICU: Neonatal intensive care; NAS, neonatal abstinence syndrome; OMT, opioid maintenance treatment.

(31). In addition, Crook et al identified several essential reasons for decreased breastfeeding rates in drug-addicted women, including the frustration of mothers with the lack of effective breastfeeding, the isolation of mother and infant as a result of infant admission to the NICU, and the prolonged hospitalization of neonates with the NAS (32).

The Lack of Motivation

The lack of maternal self-confidence, the lack of knowledge, and the feeling of being guilty also negatively influence breastfeeding rates in mothers who are drug abusers. Agunbiade et al (33) demonstrated that the rate of breastfeeding decreased by 26% due to the unwillingness of mothers to breastfeed which was due to drug addiction. In the study by Demirci et al, the frustration of mothers about the ability of infants to latch-on made these women skeptical of trying to breastfeed their children (31).

Lack of Knowledge

The lack of knowledge about the guidelines of breastfeeding for mothers who are under maintenance treatment is one of the barriers to breastfeeding (32).

Miscellaneous Issues

Javan et al found that lower rates of breastfeeding in opioid-dependent women might be due to the decreased production of breast milk, reduced infant care, family-social problems, and maternal psychological disorders (3).

Infantile Issues

In another study by McQueen et al, infants who suffered from the NAS often demonstrated symptoms such as hypertonicity, irritability, suck and swallow incoordination, as well as vomiting, and nasal stuffiness, which could complicate the process of breastfeeding (34).

Family Issues

According to the study of Demirci et al, the lack of family and spouse support for breastfeeding, as well as partners and the anxiety about the transfer of methadone through breast milk made the mothers uncertain about breastfeeding their newly born neonates (31).

Social Issues (Health Care Providers Such as Physician, Midwife, and Nurse)

The lack of adequate information and supportive resources in the human community are considered as barriers to breastfeeding. Balain and Johnson indicated that the dearth of knowledge and the malpractice of health care providers about breastfeeding during maintenance treatment could lead to misunderstanding and thus keeping the mothers away from breastfeeding (11). Demirci et al reported that the absence of a support system is one of the most significant barriers to exclusive breastfeeding in opioid-dependent women since drug-addicted mothers, as the channels of knowledge, can share their experience with practitioners in order to manage public breastfeeding. Similarly, they found that the use of non-scientific internet information about breastfeeding and the lack of nurse support for breastfeeding are regarded as potential barriers to exclusive breastfeeding (31). Moreover, Crook et al reported several reasons that accounted for decreased rates of breastfeeding among mothers with drug addiction, including frustration with the lack of effective breastfeeding, the separation of mother and child for infant admission to the NICU, and lack of education regarding established national guidelines for breastfeeding with maternal methadone use, leading to inconsistent support from medical teams (32).

Strategies for Increasing the Breastfeeding Rate in Opioid-Dependent Mothers

There are various strategies for increasing the duration of continued breastfeeding in opioid-dependent women such as pregnancy training, mother-infant rooming-in, mother-infant skin-to-skin contact at the early hours of delivery, outpatient treatment of infants affected by NAS, and the availability of baby-friendly hospitals.

Pregnancy Training

To increase the rate of breastfeeding in opioid-dependent women, counseling sessions should be held to clarify the safety of breastfeeding, and this information should be empowered by the initial referral of pregnant women to counseling centers before delivery. In addition, the contents of prenatal education for these women and their families could consist of strategies for the treatment and care of infants affected by NAS with an emphasis on breastfeeding. In the postpartum period, health care providers and nurses should warn the lactating mothers, who have a history of drug abuse, about the use of drugs during the breastfeeding period. Further, the health care workers should facilitate an open communication line between themselves and the counselors so that drug-dependent mothers could share their information with health care providers in the case of having problems (35).

Mother-Infant Rooming-in

Mother-infant rooming-in provides an opportunity for both mother and infant to have further contact with each other that could diminish the duration of hospital stay, as well as the need for the treatment of the NAS. Furthermore, the promotion of breastfeeding must be carefully advised for drug-addicted women in the case of their ability to breastfeed and the reduction of maintenance dose in their serum samples (36).

Skin Contact

The AAP advises the early mother-infant skin-to-skin contact with the stable condition. It also recommends the mothers to breastfeed their infants in order to improve their nutrition status. According to the AAP, breastfeeding has positive impacts on the feeling of mothers toward their infants (37). The researchers concluded that infants who had skin contact with their mothers, experienced less crying, and the rate of breastfeeding was higher in mothers who had skin contact with their infants in the first 1-4 months after gestation. Moreover, the duration of breastfeeding was higher in mothers who had skin contact with their infants compared to those who had no skin contact with their infants (38). It should be noted that mother-infant skin-to-skin contact and the lactation through the breast can stimulate the secretion of oxytocin in the brain of the mother, leading to a reduction in the pain, stress, and anxiety in mothers which could allow them to pay more attention to their infants (39).

The Outpatient Treatment of the Infant With NAS

In most hospitals, the treatment procedures of NAS, routinely performed in the NICU, would take more than a few weeks. This can isolate mothers from their neonates

during the hospital stay of infants. Although many hospitals allow mothers whose infants are hospitalized in the NICU to stay with their infants, many mothers who have other children in the home cannot benefit from this advantage and thus should stay away from their infants. The outpatient treatment of infants affected by the NAS provides an opportunity for mothers and infants to stay with each other and further facilitates breastfeeding and mother-infant skin-to-skin contact (40).

Implementation of Baby-Friendly Hospital Strategies

According to the World Health Organization, ten policies should be implemented for baby-friendly hospitals to guarantee successful breastfeeding. Breastfeeding policy should be regularly notified to all health care workers and the education of all health care personnel is essential for implementing such policies. In addition, all pregnant women must be trained to be familiar with the benefits and management of breastfeeding and health care providers should help mothers to breastfeed their infants at the early hours of the postpartum period. Further, the mothers should be trained on how to breastfeed and store breast milk even in the case of infant separation from the mother and infants should not be fed with any food and beverage except for breast milk unless ordered by the physician. Furthermore, mother-infant rooming-in should be provided and mothers must be permitted to stay with their infants for 24 hours. Moreover, mothers have to be encouraged to breastfeed their infants as much as the infant needs breast milk. Neither pacifier nor artificial nipples should be applied as well. Finally, group supporting breastfeeding must be established and the referral of mothers should be carried out at the time of infant discharge (32).

Discussion and Conclusions

The results of the present research demonstrated that despite common recommendations on breastfeeding, the initiation and continuance of exclusive breastfeeding are still low in opioid-dependent mothers. Most of these mothers encounter problems during the first 6 months of breastfeeding. The results of various studies were integrated into the 4 investigations by means of the combined obstetric and addiction care model. Two studies represented that the percentages of breastfeeding were 20.3% (29) and 27.7% (30), indicating a decreased rate of lactation whereas 2 other studies reported higher breastfeeding rates in which the percentage of breastfeeding reached 77% (27) and 70% (41). This discrepancy might be due to the type of medications used for the treatment of addicted women. In other words, mothers were taking buprenorphine in studies with higher breastfeeding rates while they received methadone in other investigations with lower breastfeeding rates. Javan et al implicated that exclusive breastfeeding lasted for 2 months in 42.9% of drug-addicted women while 34.3% of them were able to breastfeed their infants for only 4 months (exclusive breastfeeding) due to the low production of breast milk, reduced infant care, family-social problems, and maternal psychological disorders (3).

Similarly, the evaluation of barriers to breastfeeding in opioid-dependent mothers revealed that there are 3 main barriers to lactation in mothers afflicted with substance abuse, including individual, family, and social obstacles. These barriers in developing countries such as Iran could be generally listed as reduced production of breast milk, reduced infant care, economic problems, family-social problems, and maternal psychological disorders (3). Although some of the mentioned obstacles are not confined to women taking methadone, the occurrence of barriers to substance-addicted participants is extremely higher when compared with women in the general population. Among the above-mentioned obstacles, the absence of support from the health care community, as well as misleading information about the risk of the simultaneous occurrence of methadone therapy and breastfeeding could delineate substantial, yet changeable, barriers to breastfeeding success. On the other hand, individual barriers consist of lacking awareness and motivation in addition to fear and misconception about breastfeeding (42-45). Other reasons that account for decreased rates of breastfeeding mothers with drug abuse include frustration with the lack of effective breastfeeding, the separation of mother and child for infant admission to the neonatal intensive care unit, and the absence of education regarding established national guidelines for breastfeeding with maternal methadone use, leading to the inconsistent support from medical teams (32). According to the reviewed reports in this survey, the paucity of support by health care centers and disinformation about the risk of narcotic transfer from the mothers' milk into their infants, along with the addiction of infants are considered as potential barriers to continued breastfeeding in these mothers. Hence, the implementation of the proposed strategies can extend the duration of exclusive breastfeeding. Therefore, it is critical for health care workers to familiarize drug-addicted mothers with current guidelines and provide necessary training to their spouse and family members since their opinion usually makes these mothers anxious, leading to the prevention of breastfeeding. Further, these women must be consulted on the cessation of cigarette smoking and drug abuse during the prenatal and postpartum periods since smoking and drug abuse result in decreased breast milk production and cause adverse neonatal/infant outcomes. These adverse effects encompass sudden infant death syndrome, hypertonicity, irritability, feeding problems, nasal stuffiness, and failure to thrive and make the process of breastfeeding more difficult when they leave without sufficient support (46). Other proposed strategies include mother-infant skin-to-skin contact, mother-infant bed-sharing, the implementation of strategies mentioned earlier that briefly include

baby-friendly hospitals, outpatient treatment of infants affected by NAS, holding training sessions with structured telephone support, and the establishment of groups whose members are opioid-dependent women could be useful for increasing continued breastfeeding in drug-addicted women. Thus, further studies are suggested to examine the barriers to breastfeeding. In line with these, further interventional studies are warranted to eliminate the current barriers which could increase the lactation period in drug-dependent women.

Limitations of Studies

One of the boundaries of the present investigation is that the nature of this study is a retrospective chart review. This study focused on definite reasons as to why mothers with substance abuse preferred not to keep on lactation and why they halted the breastfeeding process. Unfortunately, a few studies have so far suggested several methods to extend the duration of breastfeeding in drug-dependent mothers. Another limitation of our research was the low sample size in studies that evaluated barriers to the initiation and continuation of exclusive breastfeeding in mothers who suffered from drug addiction.

Summary of Recommendations for Practice and Research (18)

What we know?

- Neonatal abstinence syndrome (NAS) has become a significant and growing problem worldwide;
- NAS annually affects nearly 32,000 infants in the United States at the cost of roughly $1.5 billion.
- The majority of infants are treated pharmacologically for NAS;
- Breastfeeding, a nonpharmacological intervention, is found to mitigate NAS symptoms and help the care of infants with NAS;
- Prenatal breastfeeding education may help increase the rate of breastfeeding initiation in infants with NAS.

What needs to be studied?

- Identification of risk factors increasing the birth infants with NAS by mothers afflicted with substance abuse;
- Perceptions of the impact of prenatal breastfeeding education on breastfeeding rate in mothers at the risk of delivering infants with NAS;
- Future investigations regarding obtaining wider options for breastfeeding interventions since this review discovered only 5 types of interventions. Randomized controlled trials with larger sample sizes in different settings are required as well. It is also significant to examine different kinds of interventions causing different results in studies investigating breastfeeding initiation, duration, and exclusiveness.

What can we do today?

- Encouraging drug-addicted mothers to breastfeed their neonates who are affected by NAS;
- Providing education regarding the benefits of breastfeeding to mothers at risk for delivering an infant with NAS;
- Encouraging lactating mothers to take maintenance therapy regardless of the dosage of methadone or buprenorphine;
- Prescribing nonpharmacological interventions for the care of the infant with NAS with the support of pharmacological treatment;
- Assessing an increase in narcotic dose in the serum samples of lactating mothers and reconsidering the safety of their use in continued breastfeeding;
- Relapsing to consume illegal substances or misusing legal drugs in 30-90 days before delivery.

Conflict of Interests

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of the manuscript.

Ethical Issues

This review was approved by the Ethics Committee of Mashhad University of Medical Sciences under the ethical code of 961730.

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