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REVIEW ARTICLE

Milk expression in the prenatal period of diabetic mothers

Expresión de leche en el período prenatal de madres diabéticas

A expressão de leite no pré-natal de mães diabéticas

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Abstract

This study aimed to assess the effectiveness of expressing breast milk during pregnancy in diabetic mothers, reducing neonatal hypoglycemia, and establishing EBF. An integrative literature review was conducted in July/August 2022 by searching for articles using the descriptors: "Milk Extraction," "Breastfeeding," "Gestational Diabetes," "Hypoglycemia," and "Prenatal Care." The databases used were PubMed, LILACS, SciELO, Ministry of Health manuals, and FEBRASGO. Sixteen studies were found, divided into the following themes: breastfeeding; humanized care; low- and high-risk pregnancy; gestational diabetes; neonatal hypoglycemia; and expressing breast milk during pregnancy. This study demonstrated the benefits of the pre-expressing method during pregnancy, requiring further scientific studies to strengthen and facilitate the implementation of this practice. This will outline protocols that will assist healthcare professionals in defining the timing of expressing, manual extraction, storage, and the best gestational age for the start of milk expression, reducing the risk of severe hypoglycemic crises in babies of diabetic mothers, avoiding the use of formulas, and strengthening EBF.

Descriptors: Breastfeeding; Diabetes Gestational; Breast Milk Expression; Hypoglycemia; Prenatal.

Resumén

Este estudio tuvo como objetivo evaluar la efectividad de la extracción de leche materna durante el embarazo en madres diabéticas, reduciendo la hipoglucemia neonatal y estableciendo la lactancia materna exclusiva. Se realizó una revisión bibliográfica integradora entre julio y agosto de 2022, buscando artículos con los descriptores: "Extracción de leche", "Lactancia materna", "Diabetes gestacional", "Hipoglucemia" y "Atención prenatal". Las bases de datos utilizadas fueron PubMed, LILACS, SciELO, manuales del Ministerio de Salud y FEBRASGO. Se encontraron 16 estudios, divididos en los siguientes temas: lactancia materna; atención humanizada; embarazo de bajo y alto riesgo; diabetes gestacional; hipoglucemia neonatal; y extracción de leche materna durante el embarazo. Este estudio demostró los beneficios del método de preexpresión durante el embarazo, por lo que se requieren más estudios científicos para fortalecer y facilitar la implementación de esta práctica. En este artículo se describirán protocolos que ayudarán a los profesionales de la salud a definir el momento de la expresión, la extracción manual, el almacenamiento y la mejor edad gestacional para el inicio de la expresión de leche, reduciendo el riesgo de crisis hipoglucémicas graves en bebés de madres diabéticas, evitando el uso de fórmulas y fortaleciendo la lactancia materna exclusiva.

Descriptores: Lactancia Materna; Diabetes Gestacional; Extracción de Leche Materna; Hipoglucemia; Prenatal.

Resumo

Objetivou-se verificar a eficácia da expressão de leite materno durante a gestação de mães diabéticas com redução de quadros de hipoglicemia neonatal e no estabelecimento do AME. Revisão integrativa de literatura com a coleta foi realizada em julho/agosto de 2022 por meio de busca de artigos utilizando os descritores: “Extração de Leite”, “Aleitamento Materno”, “Diabetes Gestacional”, “Hipoglicemia”, “Pré-Natal”. As bases de dados que foram utilizadas foram a PubMed, LILACS, SciELO, manuais do Ministério da Saúde e FEBRASGO. Foram encontrados 16 estudos, divididos nas seguintes temáticas: aleitamento materno; assistência humanizada; gestação de baixo e alto risco; diabetes gestacional; hipoglicemia neonatal; e expressão do leite materno durante a gestação. Este estudo comprovou os benefícios do método de ordenha prévia durante a gestação, carecendo de mais estudos científiicas que fortaleçam e facilitem a implementação da sua prática, delineando assim, protocolos que vão auxiliar os profissionais de saúde na definição quanto ao tempo de ordenha, extração manual, armazenamento e melhor idade gestacional para o começo da expressão de leite diminuindo os riscos de crises de hipoglicêmia graves em bebês de mães diabéticas evitando o uso de fórmulas e fortalecendo o AME.

Descritores: Aleitamento Materno; Diabetes Gestacional; Extração de Leite; Hipoglicemia; Pré-Natal.

Introduction

The Ministry of Health (MS) recommends breastfeeding for up to two years or more, and exclusively for up to six months. The benefits of breastfeeding are numerous, including preventing infections, thus reducing the number of infant deaths, preventing diarrhea, dehydration, and respiratory infections, reducing the risk of allergies, hypertension, diabetes, and high cholesterol, reducing the risk of obesity, and having positive effects on the child's intelligence. Breastfeeding provides complete nutrition for the baby, meeting all their needs in the first six months of life[1,2].

The benefits extend beyond the baby; it promotes the mother-baby bond, creating emotional bonds between them, bringing psychological benefits to both, and providing a sense of happiness, positively impacting the entire family's life. It protects against breast cancer, ovarian cancer, uterine cancer, and obesity. It is also used as a contraceptive method to prevent pregnancy in the first six months after birth for an exclusively breastfed baby. Breastfeeding also reduces financial costs. Not breastfeeding can be detrimental to low-income families, generating increased costs for formula. This expense can represent more than half of the family's income, leaving other family needs unmet. It promotes quality of life, preventing illness and medical expenses for the baby[1,3].

Ministry of Health Ordinance No. 371, of May 7, 2014, recommends ensuring immediate and continuous skin-to-skin contact between mother and baby and encouraging breastfeeding within the first hour of life, provided the health conditions of both allow, a moment known as golden hour. The importance of the golden hour is well known and brings many benefits to the baby, such as colonizing the microbiota and stimulating breastfeeding within the first hour of life. The baby may not yet be able to suck effectively, but simply latching on or even licking the areola will trigger the release of a hormone called oxytocin, which helps with uterine contractions, preventing hemorrhage. Oxytocin is also responsible for milk ejection, thus acting on the mammary glands, promoting milk release and facilitating the breastfeeding process[4].

Breastfeeding is a challenge for both mother and baby. Numerous complications can occur during this period, and this is one of the main causes of early weaning. Most of these are painful if not treated promptly, such as mastitis, breast abscess, blocked ducts, and many others. Some are easier to resolve than others. Poor latch is a fairly common problem, and when combined with other factors, it becomes very difficult for mothers to continue breastfeeding, in addition to not always having access to a support network. Some maternal conditions also make breastfeeding more difficult, especially in the first hours of life[2,3,5].

The beginning of breastfeeding is challenging, and some factors can further hinder the lactogenesis process, such as stress, or when this process is delayed or prevented. Some women with diabetes experience a delay or absence of lactogenesis at first, and their baby needs this food for caloric intake and to prevent or even treat hypoglycemia[6,7].

Gestational diabetes (GDM) is defined as any degree of glucose intolerance, with onset or first recognition during pregnancy. According to the Ministry of Health, it is the most common metabolic problem during pregnancy, affecting between 3% and 13% of pregnancies[5,6,8].

Healthcare professionals should be alert to women planning pregnancy; all women should undergo screening to determine the risk. These women must become pregnant with adequate blood glucose levels to prevent some malformations associated with hyperglycemia[9].

The classic symptoms of diabetes are polyuria, polydipsia, polyphagia, and involuntary weight loss (the acronym 4 ps). The Ministry of Health recommends that all pregnant women undergo screening for GDM based on risk factors during prenatal care. All pregnant women and their caregivers should be informed about the benefits and risks of GDM. GDM screening is recommended by the World Health Organization and should be offered at the first consultation and/or at 24 to 28 weeks of gestation[6,10].

It's important to monitor at-risk groups; this reduces the incidence and subsequent consequences of hypoglycemia. Diagnosis and treatment should be initiated early, as a delay in correcting hypoglycemia can lead to neurological damage. Hyperinsulinism occurs when there is an increased utilization of glucose; one of the causes of hyperinsulinism is the baby's mother having diabetes[11-13].

Mothers who have gestational diabetes have a higher risk of experiencing some complications that can affect exclusive breastfeeding. These women generally have a late onset of lactation, and delivery generally occurs before term. Therefore, it is important to analyze mechanisms that can contribute to the success of exclusive breastfeeding (EBF)[2].

Hyperglycemia can be harmful not only to the mother but also to the baby. One of the maternal complications is an increased incidence of preeclampsia in the current pregnancy, which increases the risk of developing diabetes and reduced carbohydrate tolerance later in life. In the baby, a common complication in babies born to mothers with GDM is neonatal hypoglycemia[11].

The clinical manifestations of hypoglycemia are often nonspecific and can be easily confused with other conditions. In some cases, babies are asymptomatic and exhibit no symptoms. Symptoms include tremors, hypotonia, irritability, lethargy, drowsiness, hypothermia, tachypnea, and others[11].

Babies of diabetic mothers have hyperinsulinism, the fetus is exposed to higher glucose levels because of the high levels of glucose in the mother's blood, so it responds by producing higher levels of insulin, but after birth it continues to repeat this pattern for a few hours until physiological adaptation, which can lead to episodes of neonatal hypoglycemia that can be defined when the plasma glucose level in the blood is below 45mg/dL or whole blood below 40mg/dL in full-term newborns (NBs) or in premature newborns, most of these babies are large for gestational age (LGA)[5,6,8,11,12].

One way to control hypoglycemia is to feed the baby as quickly as possible and repeat the glucose test in 30–

60 minutes. As previously mentioned, golden hour, the first hour of a baby's life after birth, is crucial, as it helps prevent and treat hypoglycemia. Early encouragement and support of breastfeeding are key strategies for ensuring newborns receive the necessary calories. In the first 24 hours of life, the mother's colostrum production is still low, which is why some studies have suggested expressing milk during prenatal care. This can be used for the baby to prevent hypoglycemia[11,14].

Currently, some research is being conducted on expressing milk during pregnancy in diabetic mothers, so that at birth, colostrum is more fluid and has a small supply to offer the baby, eliminating the need for additional milk. This helps establish breastfeeding. Breastfeeding should begin as soon as possible, as it has numerous benefits for both mother and baby, as mentioned above[15].

Hypoglycemia can lead to complications that require admission to an intensive care unit (ICU), creating prolonged separation between mother and baby and, in some cases, preventing the initiation of breastfeeding. These babies are also at risk of requiring infant formulas, which can also interfere with the initiation of breastfeeding and its success over time. In cases where lactogenesis - the production of breast milk shortly after birth - is difficult, expressing milk prenatally can be a measure to encourage milk expression for immediate postpartum use[6,16].

The milk would be manually expressed and frozen. When birth was imminent, this milk would be thawed and offered to the newborn at golden hour, encouraging skin-to-skin contact whenever the clinical condition of both allows. The milk can be kept in the freezer for up to 15 days, and it's important to note that it should be stored in glass jars with plastic lids[6,7].

Given the above, a study was conducted to determine the importance of expressing milk during pregnancy in diabetic women, reducing hypoglycemic episodes in their babies. The aim was to evaluate whether expressing milk during pregnancy reduces hypoglycemic episodes in their babies postpartum, thus aiding in the establishment of exclusive breastfeeding. The hypothesis is that breast milk in the first hours of life reduces episodes of neonatal hypoglycemia.

Numerous protocols and manuals address breast milk expression, relief pumping, and lactation maintenance. However, little is known about the effectiveness of diabetic women's milk expression during pregnancy in reducing hypoglycemic episodes in their babies. This study is justified by the knowledge that neonatal hypoglycemia is one of the most common conditions in newborns of diabetic mothers and can cause permanent harm to the child's life. Thus, its relevance extends beyond motherhood. This study aims to provide information for healthcare professionals and students working in the prevention and promotion of breastfeeding, and for counseling these mothers. We still have little knowledge on this topic, so this study aims to contribute, in conjunction with other scientific studies that may emerge, to greater clarification of the benefits of this practice, in addition to enriching the knowledge of professionals involved in breastfeeding.

The objective of this study was to verify the effectiveness of breast milk expression during pregnancy in diabetic mothers with a reduction in neonatal hypoglycemia and the establishment of EBF.

Methodology

This is an integrative literature review, a method that synthesizes knowledge and the applicability of results from significant studies to practice, synthesizing results from published research on specific topics, directing them towards practice, and basing it on scientific knowledge[17].

The integrative review is developed in six phases: 1) Identification of the theme and elaboration of the guiding question; 2) Search for articles in electronic databases through inclusion and exclusion criteria; 3) Collection and organization of data; 4) Critical analysis and evaluation of the selected studies; 5) Interpretation and discussion of the results and 6) Presentation of the integrative review[18].

After identifying the theme, the guiding question was developed according to the PICo strategy (P – Person, I – Interest, and Co – Context), a tool used to construct research questions, enabling a correct definition of information and evidence necessary for its resolution, providing a greater scope of research and maximizing the search in databases[19]. Where: P: Babies of diabetic mothers; I: Reduction in cases of hypoglycemia in babies of diabetic mothers; Co: Importance of expressing milk during pregnancy in diabetic women. Thus, the following guiding question was developed: "What is the best scientific evidence on the reduction of episodes of neonatal hypoglycemia in the postpartum period with the use of expressing milk during pregnancy in diabetic women?".

Chart 1. Search strategies implemented. Rio de Janeiro, RJ, Brazil, 2022

Database	Strategies	No.
SciELO	"Diabetes gestacional *AND* hipoglicemia; Extração de leite *AND* diabetes gestacional; Aleitamento materno *AND* diabetes gestacional; Pré-natal *AND* Extração de leite"	14
LILACS	"Diabetes gestacional *AND* hipoglicemia; Extração de leite *AND* diabetes gestacional; Aleitamento materno *AND* diabetes gestacional; Pré-natal *AND* Extração de leite"	50
PubMed	"Diabetes gestacional *AND* hipoglicemia; Extração de leite *AND* diabetes gestacional; Aleitamento materno *AND* diabetes gestacional; Pré-natal *AND* Extração de leite"	382

A search for journals was conducted in electronic databases. Data collection was conducted in July/August 2022 by searching for articles using the descriptors: "Milk extraction," "Breastfeeding," "Gestational Diabetes," "Hypoglycemia," and "Prenatal." Research was conducted on the Health Sciences Descriptors (DeCS) website. The databases used for this research were PubMed and Latin American and Caribbean Literature in Health Sciences (LILACS), the Scientific Electronic Library Online (SciELO), and manuals from the Ministry of Health and FEBRASGO.

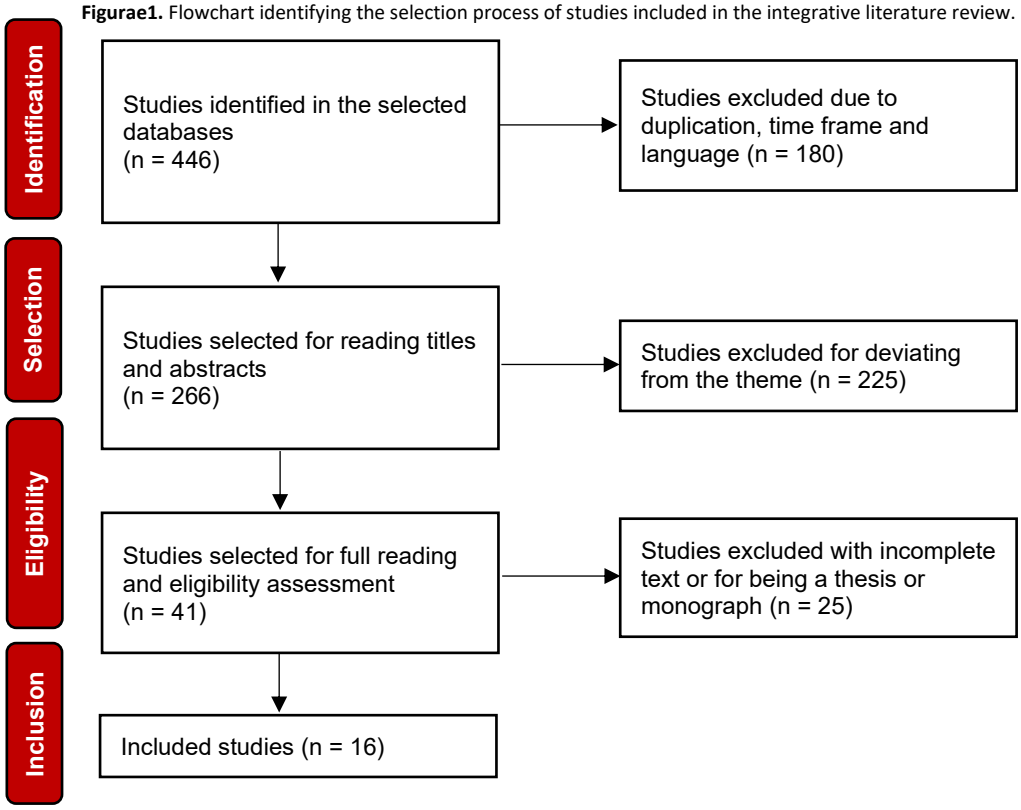
The following inclusion criteria were defined to compose the sample: a) articles in Portuguese and English; b) publications made in the last five years (2016-2021); c) articles within the study theme; d) full texts available free of charge; e) manuals from the Ministry of Health and the FEBRASGO Breastfeeding Manual.

Articles that deviated from the proposed theme, duplicate publications, incomplete texts, publications published more than five years ago, articles not in English or Portuguese, theses, and monographs were excluded.

Regarding the search process for articles in electronic databases, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model, consisting of four steps, was used. The PRISMA Flowchart aims to help authors improve the reporting of systematic reviews and meta-analyses and can be used for critical evaluation of published reviews[20].

After reading, thematic analysis was applied according to Minayo[21], in which the categorizations of the themes were made in the discussion.

Figurae1. Flowchart identifying the selection process of studies included in the integrative literature review. Rio de Janeiro, RJ, Brazil, 2022



Results

Using the selected descriptors, a total of 446 articles were found in the databases: 14 articles in the SciELO database, 50 in the LILACS database, and 382 articles in PubMed. For the additional search, the Ministry of Health manuals and the FEBRASGO breastfeeding manual were used. The following is a summary of the 16 studies selected for this review (Chart 2).

Chart 2. Summary of articles used in the integrative literature review. Rio de Janeiro, RJ, Brazil, 2022

Title/ Year	Authors	Objective	Results
Cadernos de Atenção Básica: Saúde da criança, aleitamento e alimentação complementar, n.º 23/ 2015	Lima ACC, *et al.*	It aims to enhance actions to promote healthy eating and support breastfeeding, in line with comprehensive care for Children's Health.	It aims to guide professionals on care related to breastfeeding and its complications, and healthy eating, in line with comprehensive care for children's health.
Breastfeeding after gestational diabetes: does perceived benefits mediate the relationship?/ 2017	Wallenborn JT, Perera RA, Masho SW.	Investigate the direct effect of gestational diabetes on the duration of breastfeeding and the perception of the benefits of breastfeeding.	Our results suggest that gestational diabetes has no direct or indirect effect on breastfeeding duration; however, the perceived benefits of breastfeeding have a direct effect on breastfeeding duration.

Dificuldades relacionadas ao aleitamento materno: análise de um serviço especializado em amamentação/ 2018	Carreiro JA, Franscisco AA, Macarcine KO, *et al*.	Analyze the association between the type of breastfeeding and the difficulties related to this practice among women and children treated at a specialized breastfeeding clinic.	Exclusive breastfeeding was practiced by 72.6% of the women treated in the first 30 days after delivery. There was a significant association between this practice and difficulties, helping to elucidate and maintain EBF.
Portaria n.º 371, 7 de maio de 2014.	Magalhães Junior HM.	Establish guidelines for the organization of comprehensive and humanized care for newborns in the Unified Health System (SUS).	It created guidelines for humanized care and established protocols so that all women and their newborns receive the same type of humanized care.
Manual do aleitamento materno da FEBRASGO/ 2015	Colameo AJ, Lages FA, Neto MA, *et al*.	Instruct health professionals on breastfeeding and its complications.	Train healthcare professionals and update them on breastfeeding care.
Caderno de Atenção Básica: Atenção ao pré-natal de baixo risco/ 2012	Soares filho AM, *et al*.	It qualifies Maternal and Child Care networks throughout the country and reduces the still high rate of maternal and child morbidity and mortality in Brazil.	Guide professionals on low-risk prenatal care and improve the quality of maternal and childcare centers.
Antenatal breastmilk expression for women with diabetes in pregnancy - a feasibility study/ 2021	Johnsen M, Klingenberg C, Brand M, *et al*.	Determine the feasibility of expressing breast milk during prenatal care, in terms of practicality and acceptability among women with diabetes treated clinically.	No obvious side effects were observed, and breastfeeding rates at discharge and 6–8 weeks postpartum were higher than in comparable studies.
Perspectives and experiences of collecting antenatal colostrum in women who have had diabetes during pregnancy/ 2019	Casey JRR, Mogg EL, Banks J, Braniff K, Heal C.	Explore and describe the experiences and perspectives of prenatal colostrum collection and storage in women who had diabetes during pregnancy.	Women with diabetes during pregnancy feel guilt and stress about the added risk of hypoglycemia for their babies and strive to provide the best for their babies by collecting and storing colostrum. It is essential to provide information about the benefits and disadvantages of collecting colostrum prenatally.
Manual Técnico de Gestante de Alto Risco/ 2012	Ministério da Saúde	Guide certain diagnostic and/or therapeutic practices and support professionals responsible for care in improving care for high-risk pregnant women.	Clarify doubts and guide/support professionals responsible for care in qualifying high-risk pregnant women.
The effects of mild gestational hyperglycemia on exclusive breastfeeding cessation nutrients/ 2016	Verd S, Sotto D, Fernández C, Gutiérrez A.	Evaluate the association between mild impairment of gestational glucose tolerance and early interruption of exclusive breastfeeding.	A brief review of the literature shows that it is well established that insulin resistance is a strong predictor of short breastfeeding duration, but the underlying causal contributors remained unclear until very recently.
Atenção à saúde do recém-nascido/ 2014	Soldateli B, *et al*.	Provide healthcare professionals with the most up-to-date scientific literature for comprehensive newborn health care.	Guide and update health professionals on comprehensive newborn care.
Real-time continuous glucose monitoring in preterm infants (REACT): an international, open label, randomised controlled trial/ 2021	Beardsall TG, *et al*.	Evaluate the efficacy and safety of continuous glucose monitoring in premature infants requiring intensive care.	In summary, the use of continuous glucose monitoring has allowed early detection and prevention of exposure to extremes of hypoglycemia and hyperglycemia in premature infants.
Identifying risk effectors involved in neonatal hypoglycemia occurrence/ 2020	Zhao T, Liu Q, Zhou M, *et al*.	Analyze the risk factors for neonatal hypoglycemia in the clinic.	The incidence of hypoglycemia in infants was significantly associated with term birth, birth weight, inadequate feeding, and maternal gestational diabetes.
Parto a termo precoce em mulheres com gestação complicada por diabetes e hipoglicemia neonatal/ 2020	Camargo, Lima Neto, Camargo, *et al*.	Examine the association between early term birth and neonatal hypoglycemia in women with hyperglycemia during pregnancy.	Neonates of women with hyperglycemia during pregnancy and early term delivery had a higher incidence of hypoglycemia than their peers born at non-early term, suggesting a risk factor for early term delivery in women with pregnancies complicated by hyperglycemia.
Avaliando os resultados da expressão do leite materno pré-natal/ 2021	Foudil-bey I, Murphy MQS, Dunn S. *et al*.	Conduct a scoping review to map the literature describing maternal and newborn outcomes with breast milk expression during prenatal care.	Commonly reported outcomes included breastfeeding status at discharge or follow-up, mode of delivery, newborn blood glucose, and time to establish full lactation.

Advising women with diabetes in pregnancy to express breastmilk in late pregnancy/ 2017	Forster, Moorhead, Jacobs, *et al*.	Determine the safety and efficacy of prenatal expression in women with diabetes in pregnancy.	There is no harm in advising women with diabetes during pregnancy at low risk of complications to express breast milk from the 36th week of gestation.

Breastfeeding provides benefits for both mother and baby. The benefits are countless, and every article at some point discusses the importance of breast milk in a baby's life. Healthcare professionals involved in this care must be aware of its importance. This is specifically highlighted in articles 1, 3, 5, and 11, which provide a broader overview of breastfeeding, its benefits, and the challenges that mothers may face.

Still on this topic, we have Article 4, a Ministry of Health ordinance that establishes comprehensive and humane practices in newborn care. Articles 6 and 9 address low- and high-risk pregnancies, focusing on diagnostic and therapeutic practices that can benefit these pregnant women, improving the quality of care provided and the technical capacity of care networks to reduce maternal and infant morbidity and mortality.

Knowing that GDM is one of the complications that can directly affect EBF, articles 2 and 10 discuss how GDM can affect breastfeeding, even shortening its duration. GDM can cause hypoglycemic episodes in newborns due to the high insulin levels to which these babies were exposed during pregnancy. Articles 13 and 14 discuss the risks and incidence of neonatal hypoglycemia in babies of diabetic mothers, and article 12 supports monitoring these babies to allow for early detection of these episodes.

Based on this, articles were raised that talk about the expression of breast milk during pregnancy - articles 7, 8, 15, 16 that portray cases of hypoglycemia do not directly impact EBF, exposing the benefits of expressing breast milk, so that at the birth of the baby, if an episode of neonatal hypoglycemia occurs, he can be offered the breast milk, without formula being the only option for these babies, knowing that early feeding is one of the ways to prevent hypoglycemia.

Discussion

After critical analysis of the studies, they were classified and arranged into four categories: Harms of gestational diabetes on breastfeeding, Breastfeeding, Expression of breast milk during pregnancy, and Training of nurses for guidance on breastfeeding.

Harms of gestational diabetes on breastfeeding

Gestational diabetes is among the comorbidities during pregnancy that can lead to serious complications for the mother and her baby. GDM is a metabolic disease that occurs during pregnancy, characterized by increased blood glucose levels and a high rate of perinatal morbidity and mortality[5,6,8,23].

Some of the risk factors for GDM are age 35 or older, overweight, obesity, excessive central fat deposition, short stature, excessive fetal growth, polyhydramnios, hypertension or preeclampsia in the current pregnancy, and obstetric history of recurrent miscarriages, among others[7,10,23].

One of the complications of GDM for the baby, as we mentioned above, is neonatal hypoglycemia; hence the importance of expressing milk during pregnancy in these women, so that, if their baby develops hypoglycemia, they can offer their own previously expressed milk[15,16].

Breastfeeding

Some benefits of breastfeeding have already been scientifically proven, including many, such as reducing infant deaths. According to the Ministry of Health, it is estimated that breastfeeding could prevent 13% of deaths in children under 5 worldwide. Breast milk is a complete food, preventing diarrhea, respiratory infections, and allergies, preventing high cholesterol and diabetes, improving the mother's health, and preventing certain types of cancer, such as breast, ovarian, and uterine cancer. It also promotes uterine contractions immediately after birth, preventing hemorrhages, and offers multiple benefits for both mother and baby[1,25].

Even with the recommendations and benefits of breastfeeding, breastfeeding rates worldwide are far from ideal. Numerous factors can interfere with breastfeeding; a mother's desire to breastfeed is not the only factor that can be decisive for successful breastfeeding. Social, cultural, and political barriers, as well as factors related to milk production, psychosocial factors, nutritional status, lifestyle, pain during breastfeeding, difficulties with latching and positioning, and the woman's health status directly impact effective breastfeeding for a minimum of six months exclusively, as recommended[6,26].

Expression of breast milk during pregnancy

To better understand breastfeeding, it's important to understand its process. During pregnancy, the breast is prepared for breastfeeding by several hormones; the most important are estrogen, progesterone, and prolactin. Ducts grow and proliferate, and lobules form. Secretory activity accelerates, and the alveoli become distended with the accumulation of colostrum. Milk secretion normally begins after 16 weeks of pregnancy. After the baby is born, the anterior pituitary gland releases prolactin, initiating lactogenesis and milk secretion. During the baby's sucking, oxytocin is released, stimulating milk production. This is why it's so important for the baby to suckle or lick the mother's nipple in the first moments of life to promote this stimulation[1,28].

However, for a woman with GDM, this lactogenesis may be delayed, impacting the establishment of exclusive breastfeeding for this baby. The baby may require breast milk close to or immediately after birth due to the risk of hypoglycemia, as this baby receives high levels of glucose during pregnancy and its body adapts to the mother's

demands during pregnancy. Early feeding is one of the most effective and least invasive ways to quickly correct possible hypoglycemic crises in this newborn. However, if this mother is not instructed to express milk during pregnancy, the baby will receive colostrum in the first feedings, which does not have enough calories to meet its needs until it adapts outside the womb. There is no alternative but to supplement the feeding with formulas, which can become an impediment to EBF[11,14-16].

Nursing training for breastfeeding guidance

Healthcare professionals need to be attentive to this mother and baby. Several factors, as mentioned above, can interfere with breastfeeding; external factors, such as the context in which the woman lives, stress, and lack of a support network, are also important factors, in addition to GDM[1,27].

Healthcare professionals need to be prepared to guide pregnant women and their families. Often, these professionals lack confidence in interacting with these mothers and are not trained to understand their cultural and socioeconomic context. Actively breastfeeding mothers report receiving both informational and emotional support[1,23,24,27].

Today, it's well known that breastfeeding has numerous health benefits for both mother and baby, not only for bonding but also for disease prevention, healthy nutrition, and as part of comprehensive child health care. The Basic Child Health Care, Breastfeeding, and Healthy Eating booklet also discusses strengthening these actions to promote healthy eating and, especially, breastfeeding support, so that these mothers have an effective support network for successful breastfeeding[1,22,25].

Along the same lines of thought, there is a discussion about health professionals intensifying guidance on breastfeeding, so that mothers feel prepared even though they know they may face some challenges due to their gestational diabetes[1,23,24,27].

As mentioned above, gestational diabetes is one of the complications that can directly interfere with exclusive breastfeeding. Some studies suggest that gestational diabetes has no direct or indirect effect on breastfeeding, but mention is made of the barriers these women may face due to the increased risk of neonatal complications, such as hypoglycemia. Women with GDM may have delayed lactogenesis, which can lead to formula introduction, making it difficult to establish EBF[1,2,24].

The Ministry of Health has also discussed the "delay in milk letdown," which in some cases only occurs a few days after birth. One way that can help milk production after birth is skin-to-skin contact with the newborn, when the newborn is ready for it[1,3,5,13,14].

Expression of breast milk during pregnancy allows newborns who present with hypoglycemia to receive colostrum from their mother, previously expressed during pregnancy to contribute to EBF, since some women with GDM have delayed lactogenesis as mentioned above[7,13-16].

Expressing breast milk helps these women gain confidence as mothers. Women with GDM felt empowered, and there were no side effects from this practice, resulting in high levels of satisfaction. This well-structured practice can help these women express milk early, in addition to increasing the rate of effective breastfeeding soon after birth, strengthening EBF[7].

Some women reported feeling that by collecting colostrum during pregnancy, they were decreasing their babies' chances of using formula, fearing they wouldn't have a natural, healthy birth. These mothers reported feeling proud and secure in giving their baby the "best" and that if the baby were to experience hypoglycemic episodes, they would be able to provide their milk without having to artificially feed. On the other hand, some women experienced great difficulty expressing milk and often felt guilty or that their bodies weren't yet ready for the "let-down", they were afraid they wouldn't be able to breastfeed because they were having difficulty expressing milk, demonstrating the need for guidance from a healthcare professional regarding milk expression during pregnancy[8].

Women with GDM have greater difficulty in establishing EBF, and this is a part of the population that will need more interventions and guidance to be able to establish EBF[10]. Healthcare professionals play a fundamental role in promoting, protecting, and supporting breastfeeding, in general, and especially in cases where there is some impediment or difficulty[11,23,24].

Newborns must have their glucose levels monitored regularly, as this is their primary source of energy during the neonatal period. Hypoglycemia can cause a variety of problems in babies, some of which are irreversible. The most effective way to prevent or treat these problems is early feeding, demonstrating the importance of expressing milk during pregnancy[13]. This would avoid complications for this baby during breastfeeding with the first milk, colostrum, thus bypassing the natural event of late lactogenesis and maintaining the benefits to the baby from colostrum, without the only alternative being supplemented with formula[13,14].

Expressing breast milk during pregnancy has been widely discussed. Expressing breast milk should follow certain steps, as described in the manual on correct milk technique, facilitating breastfeeding immediately after birth or expressing milk during pregnancy for mothers with GDM, with the steps being identical. It is important to follow these steps to avoid milk contamination and ensure proper storage. Expressed milk can be stored in the refrigerator for up to 12 hours or in the freezer for 15 days. It should be stored in a glass container with a plastic lid. All these steps should be explained to the mother at the time of the consultation with the professional[11,14-16]

These women demonstrated the safety and acceptability of expressing breast milk during pregnancy. Low-risk pregnant women were advised to express breast milk starting at 36 weeks of gestation. Expressing can be recommended for these women to accelerate lactogenesis, increase breastfeeding success, and/or support colostrum collection for postpartum use. There is a need to define the best time to begin expressing, defining the gestational age for the onset of breast milk expression. Research conducted

for this study revealed that there is no protocol that determines the gestational age for breast milk expression[15,16,29].

Conclusion

Based on the available evidence, this study demonstrates that expressing milk during pregnancy is a safe practice and does not pose any harm to the pregnant woman. However, protocols should be established to ensure this practice is better managed not only by professionals but also by mothers. Professionals must master communication strategies and listen sensitively to the mother's feelings. The scientific evidence found in this study shows that early feeding is the best alternative for reducing cases of neonatal hypoglycemia. Expressing breast milk during pregnancy for mothers with GDM offers a new perspective, allowing them to offer their own previously expressed milk instead of formula, aiding in the establishment of EBF and reducing cases of hypoglycemia. It was difficult to find studies addressing expressing milk during pregnancy in women with GDM.

It has been demonstrated that we still have a long way to go, confirming the need for further research on the topic in search of more scientific evidence that will strengthen and facilitate the implementation of this practice. Further studies are needed to build on this one to outline protocols that can assist these mothers regarding the timing of milk expression, manual extraction, storage, and the best gestational age for the onset of milk expression. This study, supported by others that may emerge, is extremely important for the scientific and professional healthcare world in understanding and improving the practice of early milk expression for mothers with gestational diabetes. Early guidance and management can contribute to reducing the severity of hypoglycemia in newborns of diabetic mothers, ensuring the well-being of both the mother and her baby.

The acceptance of the practice by these mothers was demonstrated, as they felt confident and proud in solving the problem with their own milk, based on the knowledge of the importance of this intervention in reducing the potential cases of severe hypoglycemic crises in their babies. It is worth noting that this practice confers maternal empowerment, as hypoglycemia can be corrected by offering their own milk, previously expressed and stored, avoiding the use of formula and strengthening EBF.

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