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Review Article

Benefits of exclusive breastfeeding: An integrative review

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ABSTRACT

Background & Aim: The importance of breastfeeding and its exclusivity in the first six months of a child's life is worldwide recognized. Despite that adherence to exclusive breastfeeding is far from international standards. Therefore, updating evidence on this topic is essential to demonstrate to parents and health professionals the benefits of exclusive breastfeeding, demystifying ideas, and promoting adherence.
Methods & Materials: An integrative review was conducted with a search in Medline, SciELO, and CINHAL databases, with the descriptors "breastfeeding", "breast", "feeding", "breastfeeding", "exclusive" and "benefits", combined with the Boolean operator "AND" and "OR", for studies published between 2014 and 2019. Of the 221 studies identified, eight were included for review.
Results: Short-term and long-term benefits of exclusive breastfeeding for children were identified such as healthier eating habits, reduced length of hospital stay, favorable weight increase, lower body mass index, lower adiposity, lower total cholesterol values, better cognitive and behavioral development, as well as stability of metabolic levels in children with metabolic disorders.
Conclusion: There are benefits for exclusive breastfeeding that must be explained to parents. Nurses must incorporate the best available evidence into their practice to enable parents to realize the impact of the choice of exclusive breastfeeding on the child's health, increasing their adherence.

Introduction

Breastfeeding becomes exclusive when the child is fed only with breast milk and does not ingest any other food, except for vitamin supplements and medications (1,2).

Breast milk contains the necessary nutrients that children healthy growth and development, protecting it from gastrointestinal (2,3,4,5) and respiratory infections, obesity, risk of allergies, endocrine diseases, and promotes mental health and psychomotor development (6). It also reduces the risk of breast and ovarian cancer in the mother and protects women against unwanted pregnancy (6,7,8,9). In adulthood, it has a reducing effect on blood pressure and cholesterol (7,8,9) and reduces the risk of diabetes mellitus (6). Given the inherent benefits, exclusivity is recommended within the first six months of a child's life (7,10).

Breast milk has the ideal nutritional composition as it is composed mostly of water, protein, fat, carbohydrates, saturated, unsaturated, polyunsaturated fatty acids and cholesterol, vitamins and minerals such as sodium, potassium, calcium, phosphorus, magnesium, iron, and zinc (10,11,12). Given the importance of exclusive breastfeeding and the numerous benefits it has for new-borns and infants, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) created, in 1991, a worldwide program to promote breastfeeding, the "Baby-Friendly Hospitals Initiative" (13). This program is implemented in organizations that have maternity services. Its purpose is to support mothers to address their difficulties during breastfeeding, as well as to promote exclusive breastfeeding during the first six months of a child's life (13). However, even

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with evidence of the advantages of this program, it is estimated that only 10% of children are born in institutions certified with this program (14).

Due to the postpartum follow-up by the "Baby-Friendly Hospitals Initiative" program on breastfeeding, and its influence on mothers' adherence to exclusive breastfeeding, it is important that these mothers continue to be supported after discharge from maternity (15,16). Thus, health staff play a key role in the promotion of exclusive breastfeeding continuity after discharge, supporting mothers, either at home or in primary health care appointments and follow up (17).

However, despite the support provided to mothers, both on maternity and after discharge, the need to return to work after maternity leave is a barrier to exclusive breastfeeding (17). This can lead to early weaning as it pushes mothers to introduce artificial milk into their children's diet, preventing them to maintain exclusive breastfeeding (16,17). Thus, in many countries, the Labor Code acts as a protective factor, as it allows mothers to take breaks during normal working hours in order to breastfeed their children. Therefore, in order to empower nurses and parents, the best available evidence on exclusive breastfeeding benefits for the child must be highlighted, in order to promote adherence. This raises one research question: What are the benefits of exclusive breastfeeding in infants?

To address this question, an integrative review was conducted with the aim to identify the benefits of exclusive breastfeeding for the child, guided by the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement, (18) with relevance to clinical practice.

Methods

An integrative review is the most comprehensive and distinctive methodological approach of reviews, and it allows to include experimental and non-experimental studies, and also combines data from theoretical and empirical literature, and has a wide range of purposes, such as the definition of concepts, review of theories and evidence (19, 20). For that, the PICO strategy was considered the most appropriate model for developing the review question, ensuring that the relevant components of the question were well defined (21). Thus, the review question, following the PICO strategy, was: (P) new-born, neonate, new-born infant, and infant; (I) exclusive breastfeeding; (C) non-exclusive breastfeeding and (O) benefits. The starting point of this review was the research question that outlined the inclusion criteria: studies in which the reported outcome were the benefits of exclusive breastfeeding among new-borns and infants. Also, with the concern to look for the most updated evidence (22), all articles published between January of 2014 and December of 2019, written in English, Portuguese, and Spanish were searched. All articles that did not fall under these criteria, including review articles, editorials, conference proceedings, and opinion articles were rejected.

Two reviewers (GC and VD) independently searched the databases Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (Medline), and Scientific Electronic Library Online (SciELO) in September 2019, further hand search was made on the references of the papers retrieved for identification of relevant research in this area. The Medical Subject Headings (MeSH) were used to select the more suitable terms to respond to the objectives of this review. The descriptors, in conjunction with *Boolean* operators, were the following: ("breastfeeding" OR "breastfeeding OR ("breast" AND "feeding")) AND "exclusive" AND "benefits". This search returned 221 articles. After the primary screening process done by titles and abstracts reading, most articles were excluded since they were not studying the benefits of exclusive breastfeeding, were repeated, or were literature reviews, as shown in figure 1.

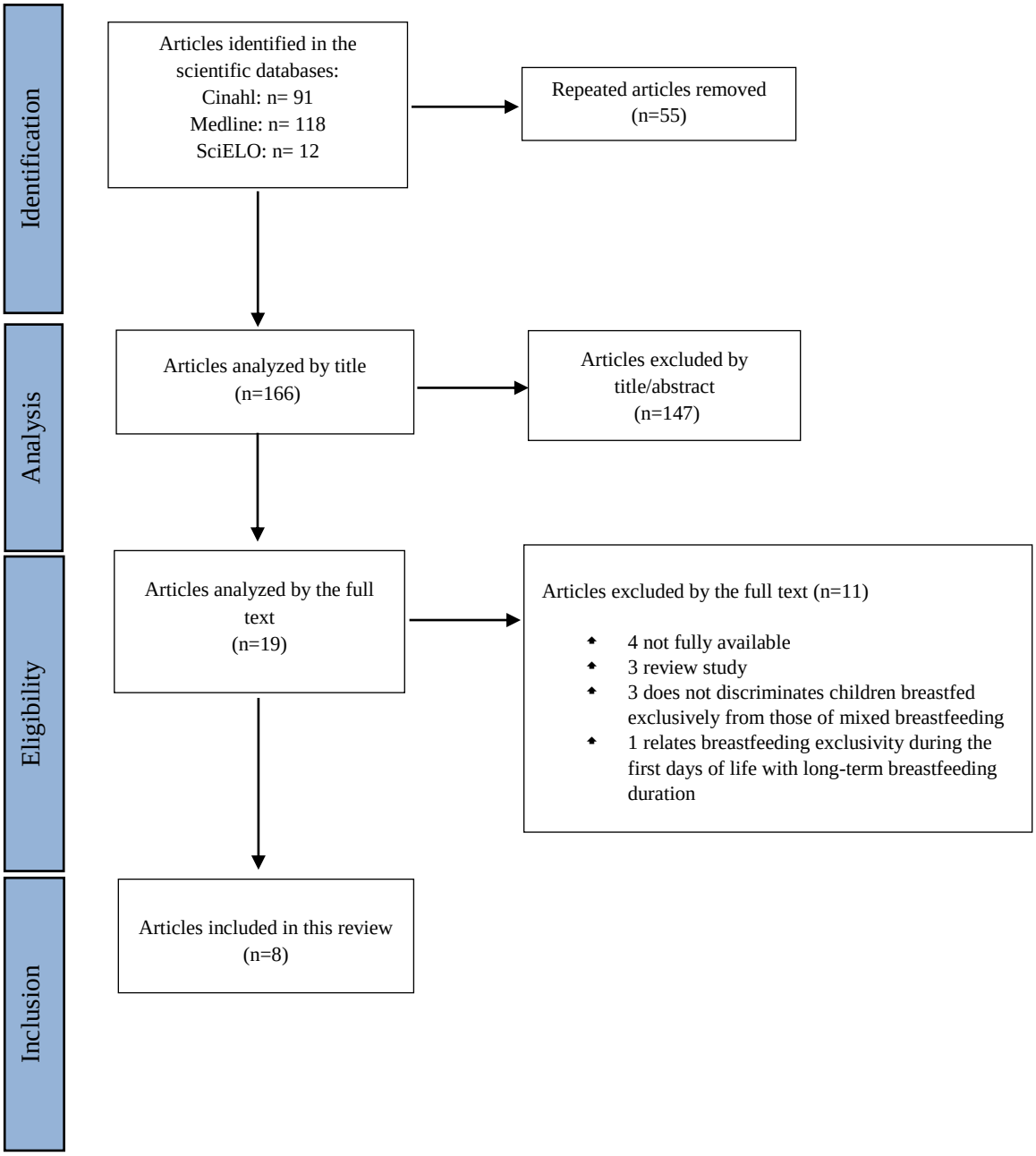

Figure 1. Study identification and inclusion process - PRISMA Diagram

For methodological quality analysis and evaluation, reviewers guided their appraisal according to the Newcastle-Ottawa Quality Assessment Scale Case-Control Studies. This instrument assesses the quality of studies according to three domains-selection, comparability, and exposure-rating with a 'star' according to methodological quality: a maximum of one 'star' for each item within the 'selection' and 'exposure/outcome' categories and a maximum of two 'stars' for 'comparability' (23). These domains are quoted with one or two stars when the item is complying with methodological standards based on the information reported and no stars when the information is insufficient to make a judgment. Two reviewers independently assessed the studies (GC and VD). The consensus was reached for all domains. After the analysis of the methodological quality, it was possible to state that the eight

articles selected for the present study, show high compliance with the three domains. A matrix was previously prepared to extract the relevant data from the articles included for review, which was independently used by the reviewers, comprising the following items/dimensions: authors, year of the study, place where it was carried out, study design, objectives, participants and results.

Results

A total of 221 articles were retrieved, of these, only eight (24,25,26,27,28,29,30,31) met the inclusion criteria. The summary of the main characteristics of these studies is described in table 1.

Table 1. Analyzed studies

Code	Authors	Year	Place	Objectives	Study design	Participants	Results
A1	Hui LL, Kwok MK, Nelson AS, Lee SL, Leung GM, Schooling CM	2019	China	To evaluate if breastfeeding has benefits over cholesterol levels. To evaluate if breastfeeding has benefits regarding adiposity and BMI.	Cohort study	3261 participants born in Hong Kong in 1997.	Babies exclusively breastfed at 3 months of age had lower total cholesterol and LDL-C values than babies fed artificial milk (p for trend = .02 and .05, respectively, 95% CI). The participants who were exclusively breastfed showed no lower BMI and adiposity at 17 years of age. Individuals who were exclusively breastfed, however, did not have a lower BMI or fat percentage.
A2	Choi HJ, Kang SK, Chung MR	2018	South Korea	To investigate the association between breastfeeding duration and infant development.	Longitudinal study	Two hundred fifty-five mothers and their infants living in South Korea were seen at three time-points based on infants' age (4, 6, and 12 months).	Compared to infants who did not breastfeed at all, infants who were exclusively breastfed until 4 months of age followed by mixed breastfeeding had better communication and social interaction at 6 months, and better cognition, communication, and social interaction at 12 months ($p < .05$, 95% CI)). Exclusive breastfeeding until 6 months of age had no apparent impact on the outcomes at 6 and 12 months ($p < .05$, 95% CI)).
A3	Jiménez BC, Parada YA, Marín AV, Marcos MSP	2017	Spain	To evaluate the benefits of breastfeeding in the first weeks of life of low birth weight infants. To check for weight gain and growth from birth to discharge. To evaluate the nutritional status and neurological development of children at two and five years of age.	Cohort study	182 newborns weighing less than 1500 kg born between January 1, 2009, and December 31, 2009, who met at the Neonatal Intensive Care Unit of the University Hospital of La Paz.	The study associates the intake of breast milk with a shorter length of stay ($p = .048$, 95% CI). Weight and length values assessed at discharge are higher in formula-fed babies than exclusively breastfed babies ($p < .001$ and $< .003$, respectively, 95% CI). It was observed that children who were exclusively breastfed had better nutritional values and improved cognitive function.
A4	Huang J, Vaughn MG, Kremer KP	2016	USA	To investigate the nurturing hypothesis (i.e., the proxy process in Fig. 1a) on the link between breastfeeding and child development in the context of family socioeconomic background and parenting behaviors.	Cohort study	3563 children aged 0–12 in 1997	The association of breastfeeding with children's academic ability is statistically positive after adjusting for family socioeconomic characteristics and parenting behaviors ($p<.001$, 95% CI). The mean differences in test scores for breastfed children and non-breastfed children were 6.80 [95% CI: 4.81, 8.79; $P<0.001$], 4.72 (95% CI: 2.90, 6.54; $P< 0.001$), and 6.00 (95% CI: 4.17, 7.83; $P< 0.001$), respectively, for the LW, PC and AP test The associations of breastfeeding

							with children's behavior problems are divergent from those of family socioeconomic characteristics and parenting behaviors, which suggest that the nurturing hypothesis may not be the primary mechanism of breastfeeding's impact on child development.
A5	Husk JS, Keim SA	2016	USA	To assess whether breastfeeding is associated with increased dietary variety at 1-3 years amongst children preterm-	Ongoing clinical trials	10-39 month-old children born before 35 weeks gestation (n = 189).	Overall, 88% of children were ever breastfed (median duration=89 days, range= 0-539), and 48% of children were ever exclusively breastfed (median duration=59 days, range=3-240). Exclusive breastfeeding duration was associated with dietary variety increases of 0.9% (95% CI=0.1-1.7) for vegetables, 1.6% (95% CI= 0.2e3.0) for meat/fish, and 1.3% (95% CI=0.2e2.4) for grain/starch, for each additional month of exclusive breastfeeding after adjustment for key confounders. Correspondingly, the variety of sweets consumed decreased by 1.2% (CI:-2.1,-0.3) per month of any breastfeeding after adjustment.
A6	Zaqout M, Michels N, Ahrens W, Börnhorst C, Molnár D, Moreno LA, Eiben G, Siani A, Papoutsou S, Veidebaum T, De Henauw S	2016	Consortium of different European countries	To determine the possible association between exposure to exclusive breastfeeding and physical fitness performance in children and, if so, whether this association is influenced by the breastfeeding duration.	Cross-sectional study	A total of 2853 European children from the IDEFICS study aged 6–11 years.	Was found a positive association between exclusive breastfeeding and lower-body explosive strength (p<.001, 95% CI) as well as flexibility (p<.014, 95% CI). Was also found a positive association between breastfeeding and balance in boys (p<.029, 95% CI), while this association was negative in girls (p<.04, 95% CI). To improve lower-body explosive strength, 1–3 months of exclusive breastfeeding were enough; a longer duration did not lead to increasing benefit. In contrast, 4–6 months of breastfeeding were necessary to have any benefit on flexibility or balance, although this became nonsignificant after adjustment for body mass index and physical activity.
A7	Perrine CG, Galuska DA, Thompson FE, Scanlon KS	2015	USA	To assess whether any and exclusive breastfeeding duration is associated with a child diet at 6 years.	Longitudinal cohort study	1355 aged 6 years.	Intake of milk, sweets, and savory snacks at 6 years was not associated with any or exclusive breastfeeding duration in unadjusted analyses. Frequency of consumption of water, fruits, and vegetables was positively associated, and intake of sugar-sweetened beverages was inversely associated with any and exclusive breastfeeding duration in adjusted models; 100% juice consumption was inversely associated with exclusive breastfeeding duration only (p<.05, 95% CI).
A8	Rossiter MD, Colapinto CK, Khan MKA, McIsaac JLD, Williams PL, Kirk SFL, Veugelers PJ	2015	Canadá	To investigate the relationship between breastfeeding duration, combination feeding, and overweight and obesity.	Cross-sectional, population based survey	5,560 grade 5 students.	Was observed that the likelihood of overweight or obesity increased in children who were the only formula-fed when compared to children who only received breast milk (p< .05, 95% CI).

Of the eight studies analyzed, one study was conducted in 2019 [A1], one in 2018 [A2], one in 2017 [A3], three in 2016 [A4, A5, A6], and two studies in 2015 [A7, A8]. Three studies were performed in the United States of America [A4, A5, A7], one in China [A1], one in Spain [A3], one in South Korea [A2], one in Canada [A8], and one study was conducted by a consortium in different European countries [A6]. Concerning the participants, in all studies children belonged to different age groups: new-borns [A3], 0 to 12 months [A4], 4 to 12 months [A2], 10 to 39 months [A5], 6 years [A7], 6-11 years [A6], 10-11 years [A8] and 17 years [A1]. One of these studies [E4] in addition to the children, their mothers were also included.

It is concluded that children that have been exclusively fed with breast milk for, at least, six or more months, had higher variety consumption of water, fruits and vegetables [A5, A7], meat, fish, and grain [A5], and lower consumption of juice and sugar-sweetened beverages [A5, A7]. There was a graded relation between breastfeeding exclusivity and lower total cholesterol [A1], fewer days of hospital stay [A3], a lower Body Mass Index (BMI) [A1, A3, A6], largest cephalic perimeter at 5 years [A3], a significantly higher mean social interaction development and communication at 6 months [A2, A3], cognition [A2, A3, A4], favorable weight on infants with metabolic disorders at discharge [A3], a lower proportion were overweight [A8] and better physical fitness, especially, flexibility [A6] compared with children that were not breastfed or mix breast milk and formula very soon.

Discussion

Results show that exclusive breastfeeding, for at least six or more months, is related to healthier eating habits, express by more varied ingestion nutrients and lower consumption of sugar-sweetened beverages [A5, A7, A5], which is supported by several previous studies (32). There was also a graded relation with lower total cholesterol [A1], which is in line with Gertosio (8).

Regarding the length of hospital stay, breast milk acts as a benefit [A3] also in premature new-borns with metabolic disorders. Exclusive breastfeeding, besides maintaining their metabolic parameters stable, also enhances a favorable increase in weight [A8]. Although premature infants with metabolic disorders exclusively breastfed have a favorable weight increase from birth until discharge, the same is not true for full-term infants, as they have a smaller increase in body weight compared to term infants fed artificial milk [A3]. The reason is that artificial milk contains less percentage of fat and a higher percentage of carbohydrates, unlike breast milk that contains a higher percentage of fat and a lower percentage of carbohydrates, resulting in that children who are fed with artificial milk eat less fat, not being so satiated, therefore with a need to ingest a larger volume of milk (33).

Breast milk thus becomes a long-term benefit over BMI as the child, when breastfed exclusively in the first six months of life, eats more fat, fewer carbohydrates, and, consequently, less milk, preventing weight gain and thus achieving better nutritional results throughout childhood, preventing accumulated adiposity and later obesity [A3, A6] (3,34,35). These studies [A3, A6] related exclusive breastfeeding to a lower BMI and adiposity but, despite that. The same was not observed in other studies [A1]. The new newborns included in this study were followed at 17 years old. After this age, they were compared in relation to their diet and their BMI and adiposity values, and it was observed that children who had been exclusively breastfed had no lower BMI and adiposity values than children fed only with artificial milk [A1]. Although in the present study it was not observed that breast milk acts as a benefit in BMI and prevents adiposity, it was observed that it has benefits regarding cholesterol levels. Breast milk contains more cholesterol

than artificial milk, leading the metabolism of breastfed children to more effectively synthesize cholesterol levels, associating exclusive breastfeeding with a better lipid profile, therefore contributing to the prevention of long-term cardiovascular disease [A1], which is in line with Binns results (36).

In addition to all the previously mentioned benefits of breastfeeding, it was also observed as a benefit a better cognitive development [A2, A3, A4]. There is contradictory evidence since in previous studies the relationship between breastfeeding and cognitive development could not be observed and in others, this relationship was detected, since exclusively breastfed children had a higher intelligence quotient (IQ) (8,9), higher than children fed artificial milk [A3] as well as higher cognitive development [A4] (37,38). This higher cognitive development in exclusively breastfed infants was observed, as both exclusively breastfed infants and artificially breastfed infants were assessed through various skills such as learning, reasoning, decision making, visual memory, auditory memory [A3], reading and writing ability, and even mathematical skills [A4], with exclusively breastfed children showing better results than those fed with artificial milk (39).

Regarding the relationship between exclusive breastfeeding and cognitive development, the relationship between breastfeeding and children's behavior has also been investigated (8). In [A4] exclusively breastfed and artificial milk-fed children's problems behaviors were compared through e.g. sudden mood swings or feelings, and fear and anxiety. It was concluded that it is not exclusive breastfeeding that influences a children's behavior but parenting behaviors and family socioeconomic characteristics. However, although it was not possible to verify the relationship between breastfeeding and child behavior in the study mentioned above, another study demonstrates that mothers breastfeeding their children contributes to an increased maternal and infant bond [A24], providing peace of mind to the child through skin-to-skin contact with the mother (40).

In summary, the benefits of breastfeeding for children are presented, in relation to their physical aspects, cognitive aspects, among others (Table 2). It is possible to verify that in all studies analyzed, the authors recognize the advantages of breastfeeding for children.

However, it is important to make certain conclusions about them, as the opinions of the authors were not always consensual. In A1, the authors do not agree with the influence of exclusive breastfeeding on BMI and adiposity, contrary to the opinion of the authors of A3. Similarly, the authors of A4 do not relate exclusive breastfeeding with behavior, contrary to the opinion of the authors of A1 and A3, since they observed a positive relationship between them.

Table 2. Summary of the benefits of exclusive breastfeeding

Physical aspects	Cognitive aspects	Others
- healthier eating habits	- Greater cognitive development	- Reduction of hospitalization time
- Stabilization of metabolic parameters	- higher IQ	- Increased maternal and child bond
- Favorable increase in weight	- Greater learning ability	
- Favorable BMI	- Greater reasoning ability	
- Prevention of weight gain / adiposity	- Greater decision-making ability	
- Obesity prevention	- Increased visual memory capacity	
- Better results in blood cholesterol levels	- Higher auditory memory capacity	
- Prevention of cardiovascular diseases		

Conclusion

The study yielded results regarding the benefits of exclusive breastfeeding since benefits were found in terms of favorable weight increase, BMI and adiposity, total cholesterol values, cognitive and behavioral development, as well as reduce the length of hospital stay after birth.

Since research plays a major role in establishing the scientific basis for evidence-based nursing practice, it is essential for the profession to question what is important and fundamental to its advancement. The study also allowed the reflection on the need to intervene strategically with regard to the promotion of exclusive breastfeeding, as it is still undervalued, given the advantages inherent to it, and the work can be used by nurses as an incentive tool for mothers to try to reduce precocious weaning. Despite all the research developed in this field, there is still some lack of consensus on this matter, impelling the need for more longitudinal studies that correctly evaluate the benefits of exclusive breastfeeding throughout life.

The limitations of this review are related to the participant's age heterogeneity and the heterogeneity of study designs and endpoints, preventing comparability. Another limitation is the probability that some studies may have been disregarded since the search was limited to three databases. Thus, the research conducted on exclusive breastfeeding aimed to enhance knowledge in this area, highlighting the relevance of the theme addressed. An investment should be made in the promotion of breastfeeding and in the training of nurses who work with couples transitioning to parenthood so that they can support them thru their difficulties.

Relevance to Clinical Practice

This review shows that are many benefits for exclusive breastfeeding that must be explained to parents so they may decide for themselves what is better for their child. Nurses must incorporate the best available evidence into their practice and, depending on their experience, expertise, patients, and resources, provide care of excellence.

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Conflict of interest

The authors declare no conflict of interest.

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