Use of breast analgesia for pain relief in newborns and infants during vaccination: integrative review

Uso de mamanalgesia para alívio da dor em recém-nascidos e lactentes durante a vacinação: revisão integrativa

Uso de mamanalgesia para el alivio del dolor en recién nacidos y lactantes durante la vacunación: revisión integrativa

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Abstract

Objective: To identify the use of breast analgesia for pain relief in newborns and infants during vaccination.
Methods: This integrative literature review was conducted in the PubMed, SciELO, Ovid, and Virtual Health Library (VHL/LILACS) databases, indexing scientific journals on nursing and related health areas in English, Spanish, or Portuguese from 2014 to 2025. The central topic was: breastfeeding during vaccination as a non-pharmacological intervention for pain relief. The question to be answered was: what is the use of breast analgesia for pain relief in newborns and infants during vaccination? It was constructed based on the mnemonic PICo: P (population): newborns and infants; I (intervention): breast analgesia as an intervention for pain relief; Co (context): scientific literature.
Results: Eighteen articles were included, most of them with strong evidence, only two of which were Brazilian. The main findings showed that breastfeeding remains the best method among non-pharmacological methods for pain relief in invasive procedures when compared to others used alone (non-nutritive sucking, holding the baby in the lap, use of local cold spray, skin-to-skin contact). However, it has a greater analgesic effect when combined with other non-pharmacological pain relief interventions.
Conclusion: This review showed that breastfeeding remains the best non-pharmacological intervention for pain relief in newborns and infants. However, the review revealed a limitation in the volume of publications and a gap in knowledge regarding practical training for nursing staff to apply breastfeeding as a non-pharmacological pain relief intervention in vaccination units.

Keywords
Breast feeding; Analgesia; Pain management; Vaccination; Newborn

Resumo

Objetivo: Identificar o uso de mamanalgesia para alívio da dor em recém-nascidos e lactentes durante a vacinação.
Métodos: Esta revisão integrativa da literatura foi realizada nas bases de dados PubMed, SciELO, Ovid e Biblioteca Virtual de Saúde (BVS/LILACS) com indexação de periódicos científicos sobre enfermagem e áreas correlatas de saúde em inglês, espanhol ou português no período 2014-2025; o tema central foi o seguinte: amamentação durante a vacinação como intervenção não farmacológica para alívio da dor. A pergunta a ser respondida foi a seguinte: qual o emprego da mamanalgesia para alívio da dor em recém-nascidos e lactentes durante a vacinação? Ela foi construída com base no mnemônico PICo: P (população): recém-nascidos e lactentes; I (intervenção): mamanalgesia como intervenção para alívio da dor; Co (contexto): literatura científica.
Resultados: Foram incluídos 18 artigos, a maioria deles com Nível de evidência forte; só dois deles eram brasileiros. Os principais achados evidenciaram que amamentação continua sendo o melhor método, entre os métodos não-farmacológicos para alívio da dor em procedimentos invasivos, quando comparado a outros isoladamente (sucção não-nutritiva, segurar no colo, uso de *spray* gelado local, pele a pele). Porém, ele tem maior efeito analgésico quando associado a outras intervenções não farmacológicas de alívio da dor.
Conclusão: Esta revisão mostrou que amamentação ainda é a melhor intervenção não farmacológica para alívio da dor em recém-nascidos e lactentes. Porém, a revisão evidenciou uma limitação no volume de publicações e lacuna no conhecimento sobre treinamentos práticos à equipe de enfermagem para aplicar a amamentação como intervenção não farmacológica de alívio da dor em unidades que realizam vacinação.

Descritores
Aleitamento materno; Analgesia; Manejo da dor; Vacinação; Recém-nascido

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Resumen

Objetivo: Identificar el uso de analgesia mamaria para el alivio del dolor en recién nacidos y lactantes durante la vacunación.

Métodos: Esta revisión integradora de la literatura se realizó en las bases de datos PubMed, SciELO, Ovid y Biblioteca Virtual en Salud (BVS/LILACS), indexando revistas científicas de enfermería y áreas de salud afines en inglés, español o portugués de 2014 a 2025. El tema central fue la lactancia materna durante la vacunación como intervención no farmacológica para el alivio del dolor. La pregunta de investigación fue: ¿cuál es el uso de analgesia mamaria para el alivio del dolor en recién nacidos y lactantes durante la vacunación? La pregunta se construyó utilizando el mnemotécnico PICo: P (población): recién nacidos y lactantes; I (intervención): analgesia mamaria como intervención para el alivio del dolor; Co (contexto): literatura científica.

Resultados: Se incluyeron dieciocho artículos, la mayoría de ellos com com alto nivel de evidencia; solo dos eran de Brasil. Los principales hallazgos mostraron que la lactancia materna sigue siendo el mejor método entre los métodos no farmacológicos para el alivio del dolor com procedimientos invasivos com comparación com otros métodos utilizados solos (succión no nutritiva, sujeción, uso de erossol frío local, contacto piel com piel). Sin embargo, tiene com mayor efecto analgésico cuando se combina com otras intervenciones no farmacológicas para el alivio del dolor.

Conclusión: Esta revisión mostró que la lactancia materna sigue siendo la mejor intervención no farmacológica para el alivio del dolor en recién nacidos y lactantes. Sin embargo, la revisión reveló una limitación en el volumen de publicaciones y una brecha en el conocimiento sobre la capacitación práctica para que el personal de enfermería aplique la lactancia materna como una intervención no farmacológica para el alivio del dolor en unidades de vacunación.

Descriptores

Lactancia materna; Analgesia; Manejo del dolor; Vacunación; Recién nacido

Introduction

Pain frequently occurs during vaccination in newborns (NBs) and infants. According to the International Association for the Study of Pain, pain can be defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. The fact that an individual is unable to communicate verbally does not exclude the possibility that they are experiencing pain and require appropriate treatment. [1] International studies estimate that NBs and infants undergo approximately 20 painful procedures during infancy (2-18 months of age) solely due to vaccines administered at Basic Health Units during this phase.[2,3]

The absence of pain relief is considered an iatrogenic practice when this possibility exists, and can have psychological, physiological, motor, cognitive, and sensory consequences. Repeated exposure to pain can lead to increased sensitivity and a heightened pain response in the long term.[2,4-6]

The impact of not providing pain relief in NBs and infants is detrimental to their neuro, physiological, and psychological development. Repeated exposure to pain is linked to changes in somatosensory processing and structural alterations in the brain, including changes in sensitivity and response to pain, reduced maturation of white and subcortical gray matter (at an age equivalent to full-term infants), and reduced cortical thickness and cerebellar volume in premature infants.[7]

Literature shows that NBs and infants remember pain. These memories create lasting memories and influence their perceptions over time, leading NBs and infants to experience feelings such as fear, anticipation, and a desire to refuse vaccination.[2,8,9]

There is solid scientific evidence recommending breastfeeding during invasive procedures in full-term infants, as it is considered the safest and most effective way to relieve pain when compared to other non-pharmacological interventions.[4,9,10] In October 2021, the Brazilian Ministry of Health published a technical note on best practices for breastfeeding as non-pharmacological measures to reduce pain during administration of injectable vaccines in children. It recommended that healthcare services encourage and support the presence of parents or guardians during and after the vaccination procedure, encouraging breastfeeding mothers to breastfeed their children immediately before and during administration of injectable vaccines. If both oral and injectable vaccines are to be administered, the oral vaccine should be given first, followed by breastfeeding so that the injectable vaccines can be administered, thus allowing mothers to breastfeed their baby during the vaccination process.[11]

The Brazilian National Council for the Rights of Children and Adolescents (In Portuguese, *Conselho Nacional de Direitos da Criança e do Adolescente* - CONANDA) has established guidelines on hospitalized children's and adolescents' rights, according to a text prepared by the Brazilian Society of Pediatrics. Among the 20 approved items, one ensures that it is the children's right not to feel pain when there are means available to prevent it. This item reinforces the importance of ensuring

that children receive care to reduce suffering and pain during hospital treatment, using all possible resources to provide relief and comfort.[12]

Nurses and their teams are the main agents on the front line. They can act directly by guiding these families through simple educational actions to alleviate pain in NBs and infants, exerting a positive or negative impact on the vaccination experience, directly helping to reduce fear, allowing mothers options for pain relief (such as breastfeeding during vaccination), and thus reframing the experience with good practices for pain relief. However, current evidence highlights that NBs and infants continue to experience unnecessary pain even when relief options are available, reflecting inadequate pain management practices by healthcare professionals.[8-10]

"Breast analgesia" is a term not yet indexed, popularly used to describe breastfeeding as a pain relief intervention in any activity that may cause pain or discomfort in NBs, infants, and breastfed children. We will use this term in this work to describe the practice of breastfeeding as a non-pharmacological pain relief intervention.

Although scientific evidence shows that breastfeeding is the most effective intervention to alleviate pain during vaccination, study results show that NBs and infants continue to experience pain due to inadequate nursing practices. Professionals' restrictive beliefs have prevailed over scientific evidence, leading them to discourage or prevent mothers from breastfeeding at the time of vaccination, even knowing that breastfeeding during vaccination reduces pain in infants. This study highlights the importance of continuing research to update nursing professionals' knowledge. Thus, further advancements in studies on this topic are necessary.[13-16]

Given the lack of recent reviews on this topic, the present study addressed the survey of studies on breastfeeding as a non-pharmacological pain relief intervention and the objective was to identify the use of breast analgesia as a non-pharmacological intervention to relieve pain in NBs and infants during vaccination.

Methods

This was an integrative literature review. This methodology was chosen to synthesize the practice of breastfeeding as a pain relief intervention, its uses, effects, and gaps.

Six stages were followed: (1) Topic identification and hypothesis selection; (2) Establishment of eligibility criteria and literature search; (3) Definition of information to be extracted; (4) Assessment of included studies; (5) Interpretation of results; and (6) Presentation of results.[17]

The review was guided by the following question: What has been the use of breast analgesia for pain relief in NBs and infants during vaccination? The review was constructed using the mnemonic PICo: P (population): NBs and infants (considered 0-28 days corrected age for NBs and 29 days to 24 months for infants); I (intervention): breast analgesia as an intervention to relieve pain during vaccinations; Co (context): scientific literature.[18]

Based on the research question, the descriptors "Breast Feeding", "Immunization," and "Pain Management" were defined. Search strategies were determined by cross-referencing descriptors using the Boolean search operators AND and OR in databases. Portals that index health-related databases were chosen, such as PubMed, SciELO, Ovid, and the Virtual Health Library (VHL/LILACS, a database indexing scientific journals on nursing and related health areas). A search strategy was formulated for each database with the help of a librarian specializing in integrative review in September 2024.

The review was conducted between 2023 and 2024, revealing a limited volume of publications and highlighting a knowledge gap regarding practical training for nursing teams to apply breastfeeding as a non-pharmacological pain relief intervention in healthcare units that administer vaccinations. Articles and abstracts freely available, as well as grey literature, studies published in English, Portuguese, and Spanish in the last ten years (2014-2024), focusing on breastfeeding during vaccination as a pain relief intervention, were included. Articles not fully available and those that did not answer the research question, including theses, dissertations, and conference proceedings, were excluded.

To collect data, the following stages were performed: reading of titles and abstracts; reading of articles in full; searching for evidence based on the article's references; and data collection. It is important

to note that each stage was performed independently by two researchers. A third researcher would be consulted if there was disagreement, assisting in the final decision. Information was entered into a Microsoft Excel® spreadsheet containing the following variables: authors; year of publication; country; objective; method; assessment of the level of evidence; sample size; participant characteristics; data collection site; non-pharmacological pain relief intervention; association with another intervention; main results and conclusion. The assessment of the level of evidence based on JBI classification (seven levels) included (I) systematic review or meta-analysis, (II) randomized controlled trial, (III) non-randomized controlled trial (quasi-experimental studies), (IV) well-designed cohort or case-control studies, (V) systematic review of qualitative and descriptive studies, (VI) descriptive or qualitative studies, and (VII) authoritative opinion or expert report. The levels were classified as strong (I and II), moderate (III to V), and weak (VI and VII).[19] Since it was a literature review, ethical submission and review of the study were not required.

Results

Initially, 77 articles were identified in the PubMed (21), SciELO (20), VHL/LILACS (22), and Ovid (14) search portals. From reading the title and abstract, 15 studies were included, excluding duplicate articles (Figure 1).

Chart 2 described the articles selected for inclusion during the integrative review.

Characterization of the studies included in the systematic review (Figure 2).

According to chart 1, there was heterogeneity in both the journals and the authors of the published arti-

Chart 1. Search strategy in databases

Database	Search strategy	References found	Selected references
PubMed	"Breastfeeding" AND/OR "Immunization" AND/OR Pain Managment	350 (AND/AND) 214,000 (OR/OR) 4,900 (COMBINED)	21
SciELO	"*Aleitamento Materno*" AND/OR "Imunização" AND/OR "*Manejo da dor*"	4 (AND/AND) 13,500 (OR/OR) 190 (COMBINED)	20
Ovid	"*Aleitamento Materno*" AND/OR "*Imunização*" AND/OR "*Manejo da dor*"	450 (AND/AND) 300,00 (OR/OR) 6,000 (COMBINED)	14
VHL/LILACS	"*Aleitamento Materno*" AND/OR "*Imunização*"	50 (AND/AND) 18,700 (OR/OR) 390 (COMBINED)	22

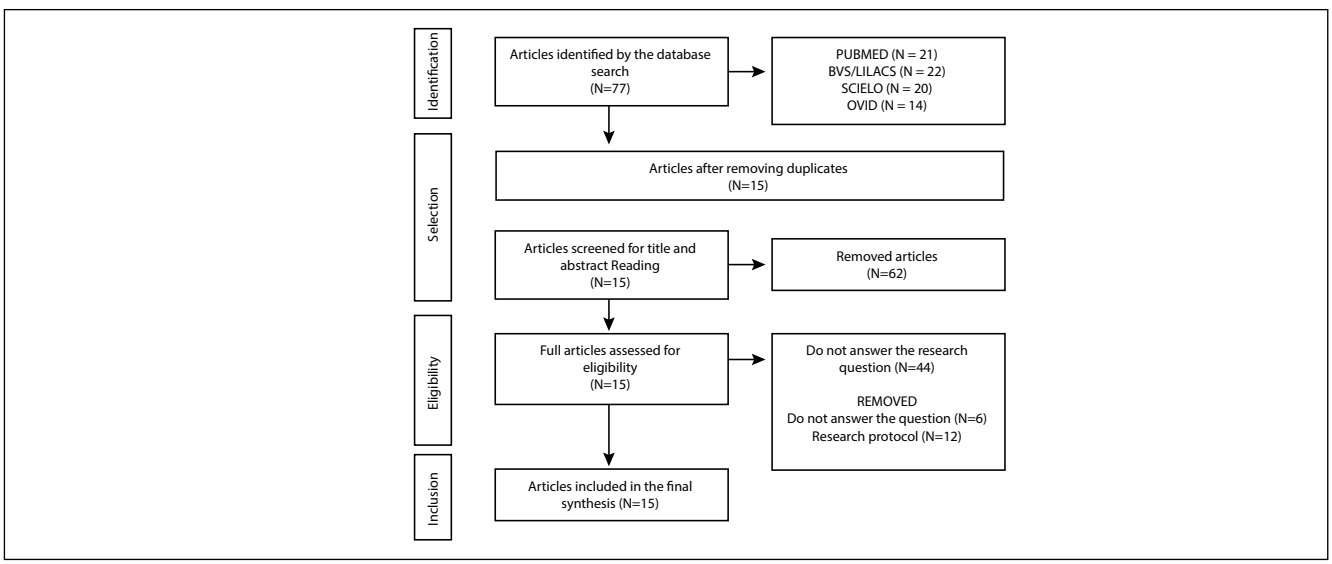

Figure 1. PRISMA flowchart: search and selection of included articles

Chart 2. Articles selected for the integrative review

	Author, Year, Country, and Journal	Study objective	Design and Level of Evidence	Sample and participants; Study location; Pain scale	Non-pharmacological interventions for pain relief	Painful procedures	Results and Conclusion
1	Shah OS *et al.;* 2023; Canada; Cochrane Database of Systematic Reviews[20]	Assess the effectiveness of breastfeeding or supplemental breast milk in reducing procedural pain in NBs.	Systematic review; Level I	66 studies on breastfeeding (36), supplemental breast milk (29), comparing breastfeeding vs. supplemental breast milk (1); NIPS, NFCS, DAN and PIPP.	Breastfeeding and supplemental breast milk; sucrose, positioning, and pacifiers	Calcaneal puncture (39 studies); venipuncture (11); intramuscular immunization (9); fundus examination for retinopathy of prematurity (4); upper airway aspiration (4); adhesive tape removal/fixation (1).	Breastfeeding reduced physiological signs of pain compared to no intervention. Moderate/low evidence: Breastfeeding or supplemental breast milk may reduce pain compared to no intervention, holding, placebo, and positioning. Low evidence: Sweetened solutions have little or no difference in pain reduction compared to breastfeeding.
2	Harrison D *et al.;* 2016; Canada; Cochrane Database of Systematic Reviews[21]	Determine the effect of breastfeeding on procedural pain in infants >28 days to 1 year old versus no intervention, placebo, parental containment, skin-to-skin contact, expressed breast milk, formula, bottle feeding, sweetened solutions, distraction, or other interventions.	Systematic review; Level I	10 studies; total sample size: 1,066 infants; NIPS MBPS.	Breastfeeding vs. other interventions (none, water, topical anesthetic, vaporizer, placebo, parental restraint, skin-to-skin contact, expressed breast milk, formula, bottle feeding, sweetened solutions, distraction)	Vaccination	Breastfeeding reduces behavioral signs of pain (crying time and pain scores) during immunization when compared to other factors. It did not consistently reduce physiological signs of pain. They concluded that breastfeeding may reduce pain in infants beyond the neonatal range during immunization, but without evidence of an effect on physiological indicators.
3	Karimi Z *et al.;* 2022; Iran; Int J Community Based Nurs Midwifery[13]	Compare the effect of breastfeeding versus sensory saturation on behavioral pain responses in infants after pentavalent vaccination.	Randomized clinical trial; Level II	171 infants aged 4-6 months; Pentavalent Vaccination Center; Modified Behavioral Pain Scale.	Breastfeeding and sensory saturation	Pentavalent vaccination	Breastfeeding and sensory saturation are effective in reducing the pain response during vaccination. Sensory saturation was more effective in this study.
4	Gad RF *et al.;* 2019; Egypt; Am J Matern Child Nurs[11]	Assess the effectiveness of oral sucrose versus breastfeeding as pain management interventions among infants during immunization.	Randomized clinical trial; Level II	120 infants aged 2-6 months; Primary Child Health Care Center; FLACC.	Breastfeeding and oral sucrose	MMR vaccination	Breastfeeding was more effective than oral sucrose in treating pain in infants during immunization.
5	Komaroff A *et al.;* 2020; USA; J Pediatr Nurs[14]	Implement a clinical protocol to introduce breastfeeding as a strategy to alleviate pain during vaccination.	PDSA; Level II	354 infants; pediatric clinic; no pain scale was used.	Breastfeeding and mother's embrace	Vaccination	The clinical protocol was an effective intervention to guide nurses on options for relieving pain during vaccine administration.
6	Taddio A *et al.;* 2014; Canada; International Association for the Study of Pain[22]	Assess the impact of implementing educational resources in prenatal classes on the parental use of analgesic interventions in future childhood vaccinations.	Randomized Clinical Trial; Level II	174 mothers and infants; Perinatal Teaching Hospital in Toronto; no pain scale was used.	Breastfeeding, topical anesthetics, and sugar water	Vaccination	Infant pain reported by the mother was lower in the experimental group. Prenatal education on pain management during vaccination resulted in greater use of pain interventions by mothers, facilitating the promotion of child health.
7	Zurita-Cruz JN *et al.;* 2017; Mexico; NutrHosp[23]	Determine the effectiveness of breastfeeding in acute pain after vaccination in 6-month-old infants compared to milk substitute and not applying any maneuver.	Randomized clinical trial; Level II	144 infants (2 to 6 months); Primary Care Units; University of Wisconsin Children's Hospital Pain Scale; UWHPS.	Breastfeeding and milk substitutes	Vaccination	The crying time with breastfeeding was significantly shorter compared to the milk substitute and control groups.

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Continuation.

	Author, Year, Country, and Journal	Study objective	Design and Level of Evidence	Sample and participants; Study location; Pain scale	Non-pharmacological interventions for pain relief	Painful procedures	Results and Conclusion
8	García NA *et al.;* 2019; Spain; An Pediatr Barc[24]	Assess interventions to reduce pain associated with vaccination: non-nutritive sucking, breastfeeding, and 50% glucose solution.	Prospective cohort study; Level II	187 infants (2 to 6 months old); *Casa de Salud Hospital* (Valencia); LLANTO scale.	Breastfeeding, 50% glucose solution, and non-nutritive sucking	Vaccination	The mean pain scale score was lower compared to non-nutritive sucking and the control group. There was no significant difference between the non-nutritive sucking and glucose solution groups.
9	Taddio A *et al.;* 2018; Canada; CMAG[3]	Compare different levels of intensity of postnatal education on pain reduction in the self-reported use of interventions by parents in future childhood vaccinations.	Randomized clinical trial; Level II	2,549 parents of infants (2-6 months old); mother-baby unit of Mount Sinai Hospital, Toronto; no pain scale was used.	Breastfeeding, sucrose, or topical anesthetics	Vaccination	Parents learned pain management techniques for vaccination prior to hospital discharge through knowledge-based techniques; there was a slight increase in acceptance of pain interventions in subsequent vaccinations.
10	Fallah R *et al.;* 2016; Iran; J Matern Fetal Neonatal Med[25]	Compare the analgesic effect of the Kangaroo Mother Care Method, breastfeeding, and swaddling in BCG vaccination in term infants.	Randomized clinical trial; Level II	120 infants who received the BCG vaccine from March to June 2015, at Shahid Sadoughi Hospital in Yazd, Iran; NIPS.	Breastfeeding, kangaroo care, or swaddling	Vaccination	The breastfeeding group had a higher success rate in vaccination against reduced pain and shorter crying duration than the other groups. The non-pharmacological intervention was most effective in relieving pain among the three studied.
11	Dar JY*et al.;* 2019; Pakistan; J Ayub Med Coll Abbottabad[26]	Test the hypothesis that breastfeeding is a good analgesic for NBs undergoing BCG vaccination.	Randomized clinical trial; Level II	60 infants who received the BCG vaccine at the Department of Pediatrics, Quetta Combined Military Hospital from June 1 to November 30, 2015. Crying time was used to compare pain between groups.	Breastfeeding	Vaccination	NBs who were breastfed before, during, and after BCG vaccination cried less than those who were not breastfed and received only routine care.
12	Gupta NK *et al.;* 2017; India; World J Pediatr[27]	Compare the synergistic analgesic effect of local anesthetics with breastfeeding and refrigerant vapor spray with breastfeeding vs. breastfeeding during wDPT vaccination.	Randomized clinical trial; Level II	90 infants up to 3 months old undergoing wDTP allocated into three groups from October 10 to September 11; NFCS, NIPS.	Breastfeeding, EMLA, refrigerant vaporizer spray	Vaccination	The addition of topical EMLA application or vapor cooling spray to breastfeeding during wDPT vaccination does not reduce crying duration in infants up to three months of age. These interventions may show a reduction in pain scores. More studies are needed to assess their effectiveness as pain relief measures in infants and children.
13	Queiroz GLR *et al.;* 2024; Brazil; RevEscEnferm USP[28]	Analyze the effect of breastfeeding on reducing pain induced by the pentavalent vaccine in infants and to identify the necessary breastfeeding time interval.	Randomized clinical trial; Level II	90 mother-infant pairs randomized FLACC.	Breastfeeding before vaccination or breastfeeding before and during vaccination	Pentavalent vaccination	Breastfeeding five minutes before and during administration of the pentavalent vaccine significantly reduced the pain score compared to breastfeeding only before the procedure.

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Continuation.

	Author, Year, Country, and Journal	Study objective	Design and Level of Evidence	Sample and participants; Study location; Pain scale	Non-pharmacological interventions for pain relief	Painful procedures	Results and Conclusion
14	Viggiano C *et al.;* 2021; Italy; Pediatr Res[29]	Compare the analgesic effect of both interventions with that of controls with bottle-feeding only up to 1 year of age and to verify maternal satisfaction.	Quasi-experimental study; Level III	162 children aged 2 to 12 months; FLACC/NIPS.	Breastfeeding and infant formula	Hexavalent and pneumococcal vaccines	Breastfeeding reduces vaccination pain from 6 months until the third dose at 12 months. Children experience very comparable analgesic effects during formula feeding. Maternal perceptions of their children's pain were matched in half of the cases.
15	Wu Y *et al.;* 2022; China; J Pain Res[30]	Examine the conduct of research on non-pharmacological treatment in children with vaccine-related pain in the healthcare setting to provide a reference for pain relief in childhood vaccination.	Scoping review; Level V	22 studies; no pain scale was used.	Gustatory, tactile, olfactory, visual, exercise, postural interventions and injection technique	Vaccination	To reduce vaccine-related pain in NBs and infants, the following order was recommended: first, breastfeeding; then, use of sweeteners; finally, non-nutritive sucking.

NB – newborn; NIPS - Neonatal Infant Pain Scale; NFCS - Neonatal Facial Code System; PIPP - Premature Infant Pain Profile; DAN - Douleur Aiguëdu Nouveau-né; MBPS - Modified Behavioral Pain Scale; FLACC - Face, Legs, Activity, Cry, Consolability; UWHPS - University of Wisconsin Hospital Pain Scale; LLANTO - *Llanto, Actitud, Normorrespiración, Tono postural e Observación facial*

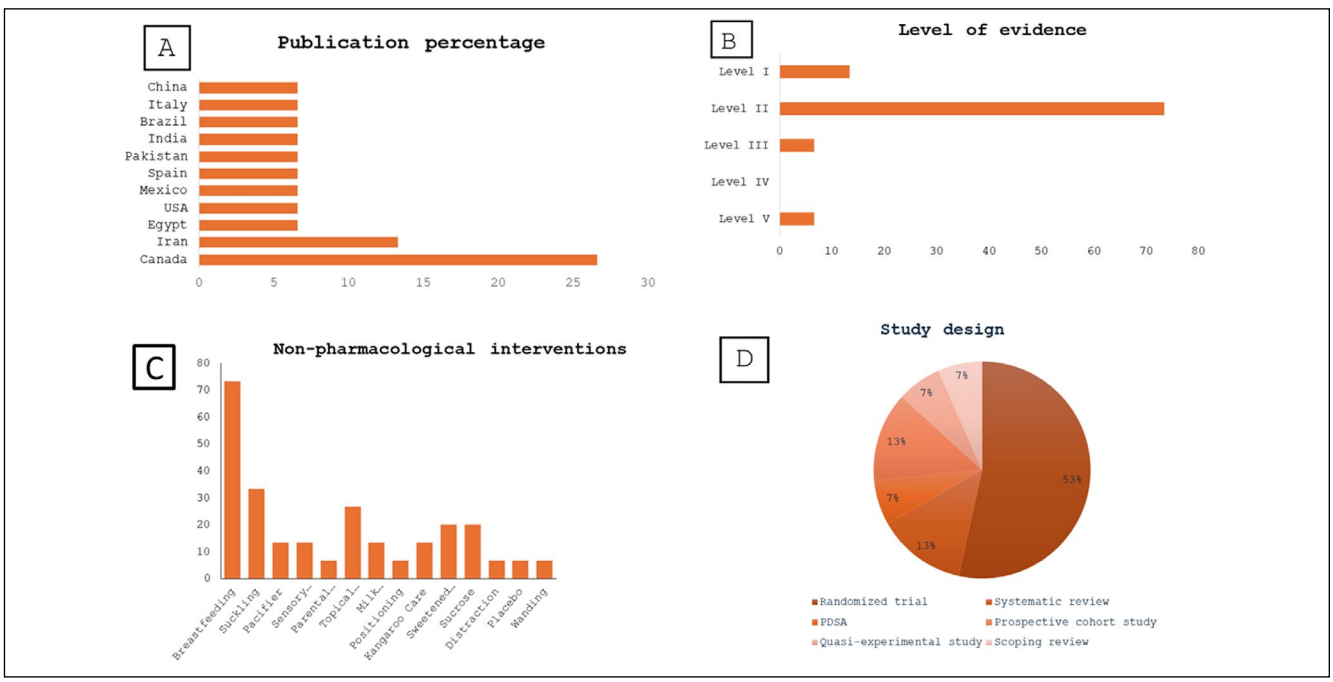

Figure 2. (A) Publication by country; (B) Level of evidence assessment; (C) Non-pharmacological interventions; (D) Study design

cles. Regarding the levels of evidence, the studies were mostly level II, and 2 articles (systematic reviews) were classified as level I. Thus, this review obtained articles with high-quality evidence outcomes. Publications from the American continent in the last eight years predominated.

The main findings of the review showed that (among non-pharmacological interventions for pain relief in invasive procedures) breastfeeding remains the best intervention when compared to other interventions alone (non-nutritive sucking, holding the baby in the lap, use of local cold spray, skin-to-skin

contact). However, breastfeeding has a greater analgesic effect when combined with other non-pharmacological pain relief interventions (such as those mentioned above).

Most studies were reviews, assessing other studies conducted during vaccination in infants up to 6 months of age (the age range corresponding to the period of exclusive breastfeeding, as recommended by the World Health Organization).[31] Of these, all review studies were unanimous in their results, suggesting that breastfeeding should be considered the first-line non-pharmacological intervention for pain relief when possible. Some of the studies (reviewed to meet the inclusion criteria for this search) were conducted in neonatal units comparing breast milk with other substances or procedures (sucrose, skin-to-skin contact, kangaroo care, expressed milk), considering the impossibility of breastfeeding by direct suction at the breast. Expressed breast milk showed a reduction in crying time and a reduction in heart rate (compared to other non-pharmacological interventions).[32]

Most studies used crying time and facial expressions of pain through specific assessment scales (such as the Neonatal Infant Pain Scale (NIPS) and heart rate) to more accurately compare control samples to intervention samples. Articles studied included procedures such as heel prick, venipuncture, intramuscular vaccination, ophthalmological examination (for retinopathy of prematurity), aspiration, and adhesive tape removal.

The most recent review on the subject concluded that breastfeeding generally reduces crying time, with a greater reduction in pain (NIPS) when compared to no intervention, placebo, or non-pharmacological interventions. Furthermore, moderate concentrations of glucose and sucrose may not make a difference in reducing pain (compared to breastfeeding as a pain relief intervention).[20]

Discussion

This review included 15 publications addressing the use of breastfeeding in relation to other non-pharmacological interventions to alleviate pain, mainly in vaccination of NBs and children up to 1 year of age. However, other procedures routinely used in maternity wards or Neonatal Intensive Care Units were also included.

Breastfeeding and expressed breast milk were recommended for a single painful procedure, as there was a significant reduction in heart rate, duration of crying, and pain measurement scales.[20] Breastfeeding significantly reduces crying time when compared with milk substitutes or no intervention.[23,29] Conversely, some studies have not found improvements in physiological responses (such as a reduction in heart rate during vaccination), although breastfeeding is also recommended after the neonatal period as the best evidence for non-pharmacological intervention to relieve pain.[21]

Sucrose administration was effective compared to pacifier use, positioning, or no intervention.[20] Furthermore, it was found that oral sucrose and non-nutritive sucking are more effective when used together.[33] Sucrose causes the NBs' bodies to release endogenous opioids that reduce the intensity of pain when experiencing punctures. Although pacifiers are used for non-nutritive sucking, their use can lead to several negative aspects such as early weaning due to nipple confusion, oral dysfunctions, and they are potential reservoirs of infection, among other harmful effects.[34,35]

The use of 50% glucose and pacifiers did not provide pain relief when used as a non-nutritive sucking intervention during infant vaccination.[3] Although breastfeeding is considered an alternative, it remains the most effective way to control vaccination-related pain in infants, followed by sucrose and non-nutritive sucking, respectively.[11,30]

Breastfeeding is also recommended compared to topical anesthetic, bandaging, and neck support for managing pain during vaccination.[21] A reduction in crying time and pain scale scores has been demonstrated when breastfeeding is used synergistically with EMLA anesthetic and cooling spray compared to breastfeeding alone.[27]

Regarding skin-to-skin contact (Kangaroo Method), it was found that the combined intervention with sucrose was more effective than the two measures used separately. This intervention proved to be safe and with satisfactory results for a single painful procedure. The duration of crying in the Kangaroo position was longer than that compared to breastfeed-

ing.[25] In contrast, one study showed no difference between skin-to-skin contact used alone or together with breastfeeding, but the result was greater than not using any intervention.[36] The Kangaroo Method guidelines strongly recommend the Kangaroo position and breastfeeding due to their effectiveness in reducing pain and stress in NBs.[37]

Distraction is another possible non-pharmacological intervention for the proper management of pain in NBs. It can be done using sensory saturation, which consists of the simultaneous stimulation of all senses. A study used lavender drops (smell), sucrose (taste), massage (touch), soft speech (hearing), and focused gaze on the babies (sight): both sensory saturation and breastfeeding were effective in reducing pain in NBs.[13]

In Brazil, a qualitative study showed that nursing staff did not perform adequate pain management for infants during immunization due to restrictive beliefs. To improve the immunization process for NBs and infants, the implementation of a protocol with evidence-based guidelines for nurses and physicians proved effective in raising awareness about breastfeeding during immunization in a pediatric clinic.[14,32]

Parental education during the prenatal period became evident in a study in which two classes on pain management were given; after that, caregivers used more pain relief interventions during the vaccination of their infant children.[24] The same result was observed in the postnatal period using educational pamphlets and videos on the subject.[22]

Breastfeeding showed the best results in the FLACC pain scale score if performed 5 minutes before and continuing during and after the painful stimulus.[27]

No studies assessing more than one painful procedure were found in the research. This could alter the results regarding crying time, pain scale scores, and physiological changes during painful procedures that are frequently performed simultaneously in Neonatal Intensive Care Units. There is a limited volume of publications and a gap in knowledge regarding practical training for nursing teams using breastfeeding as a non-pharmacological pain relief intervention in vaccination units.

We hope that this review can provide further evidence to raise awareness among nurses working in the maternal and child health field that breastfeeding is the first-line treatment for non-pharmacological pain relief in infants/NBs and infants so that this intervention is increasingly used in nursing professionals' clinical practice.

Conclusion

Breastfeeding remains the best non-pharmacological intervention for pain relief in NBs and infants. However, breastfeeding can be used in conjunction with other interventions to enhance analgesic effects during painful procedures. As a suggestion for future studies, training nursing teams in vaccination rooms would be a possibility for greater family adherence to this practice.

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