Review Article

Effective interventions for treating nipple trauma resulting from breastfeeding: a systematic review

Intervenções eficazes para tratamento de trauma mamilar decorrente da amamentação: revisão sistemática

Intervenciones eficaces para el tratamiento de trauma mamilar resultante de la lactancia: revisión sistemática

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Abstract

Objective: To identify interventions based on effective scientific evidence for treating nipple trauma due to breastfeeding.

Methods: This is a systematic review, carried out in the MEDLINE®/PubMed®, Scopus, CINAHL, Web of Science, Cochrane and LILACS databases, between August and September 2020. The descriptors nipple* AND wound and injuries OR trauma AND therapeutic OR treatment AND breastfeeding were used. Intervention studies, without language and time restriction, full text and that did not address nipple trauma not related to breastfeeding were included. Effective interventions were considered those with positive outcome for tissue repair and/or pain. The searches were in pairs, and the quality of the trials was assessed by the Jadad scale and by the Grading of Recommendations Assessment, Development and Evaluation.

Results: The final sample was composed of seven articles, found in the CINAHL, Web of Science and Scopus databases. The effective interventions found involved chamomile ointment, use of highly purified lanolin, low-level laser photobiomodulation, honey, millefeuille and breast milk. Each intervention found was used in different situations and in different ways, which should be considered for clinical practice. Guidance on the handle was present in association with most effective interventions.

Conclusion: The interventions evidenced may contribute to reduce difficulties in breastfeeding, in the reduction of pain and injury tissue repair.

Resumo

Objetivo: Identificar intervenções baseadas em evidências científicas eficazes para o tratamento de trauma mamilar decorrente da amamentação.

Métodos: Revisão sistemática realizada nas bases de dados MEDLINE®/PubMed, Scopus, Cinahl, *Web of Science*, Cochrane e Lilacs, entre agosto e setembro de 2020. Foram utilizados os descritores *nipple** AND *wound and injuries OR trauma AND therapeutic OR treatment AND breastfeeding* (Mamilo* e ferida e lesões ou trauma e terapêutica ou tratamento e amamentação). Os critérios de elegibilidade foram: estudos de intervenção, sem restrição de idioma e tempo, texto completo e que não abordassem trauma mamilar não relacionado à amamentação. Foram consideradas intervenções eficazes aquelas com desfecho positivo para reparação tecidual e/ou dor. As buscas foram em pares, e a qualidade dos ensaios foi avaliada pela escala Jadad e pelo *Grading of Recommendations Assessment, Development and Evaluation*.

Resultados: A amostra final foi de sete artigos, encontrados nas bases de dados Cinahl, *Web of Science* e Scopus. As intervenções eficazes encontradas envolveram: pomada de camomila, uso de lanolina altamente purificada, fotobiomodulação com *laser* de baixa potência, mel, mil-folhas e leite materno. Cada intervenção

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encontrada foi usada em situações e de maneiras diferentes, que devem ser consideradas para a prática clínica. Orientações sobre a pega estiveram presentes em associação com a maioria das intervenções eficazes.

Conclusão: As intervenções evidenciadas podem contribuir para diminuir as dificuldades na amamentação, na redução da dor e na reparação tecidual das lesões.

Resumen

Objetivo: Identificar intervenciones con base en evidencias científicas eficaces para el tratamiento de trauma mamilar resultante de la lactancia.

Métodos: Revisión sistemática realizada en las bases de datos MEDLINE®/PubMed, Scopus, Cinahl, *Web of Science*, Cochrane y Lilacs, entre agosto y septiembre de 2020. Se utilizaron los descriptores *nipple* AND wound and injuries OR trauma AND therapeutic OR treatment AND breastfeeding* (pezón* y herida y lesiones o trauma y terapéutica o tratamiento y lactancia). Los criterios de elegibilidad fueron: estudios de intervención, sin restricción de idioma y tiempo, con texto completo y que no trataran trauma del pezón no relacionado a la lactancia. Se consideraron intervenciones eficaces las que presentaron desenlace positivo para la reparación de los tejidos y del dolor. Las búsquedas se hicieron por pares y la calidad de los ensayos se evaluó a través de la escala Jadad y por el *Grading of Recommendations Assessment, Development and Evaluation*.

Resultados: La muestra final estuvo formada por siete artículos, encontrados en las bases de datos Cinahl, *Web of Science* y Scopus. Las intervenciones eficaces encontradas contuvieron: pomada de camomila, uso de lanolina altamente purificada, fotobiomodulación con *láser* de baja potencia, miel, milenrama y leche materna. Cada intervención encontrada fue usada en situaciones y de maneras distintas, que deben ser consideradas para la práctica clínica. Orientaciones sobre la prendida estuvieron presentes junto con la mayoría de las intervenciones eficaces.

Conclusión: Las intervenciones evidenciadas pueden contribuir para reducir las dificultades de la lactancia y el dolor, y para reparar los tejidos de las lesiones.

Introduction

Breastfeeding is the method that provides the best food to children, being the main source of nutrients, able to meet newborns' basic needs. Human milk acts to nourish a being, promote a deep bond between mother and child and provide the growth of newborns, through immunomodulatory and protective substances.[1] It has vitamins, minerals, proteins, fats, carbohydrates and antibodies essential to the baby.[2]

Human milk provides several benefits to children and mothers. In children, it promotes better intellectual development, prevents obesity, heart disease, contagious and allergic diseases, and relieves cramps. In mothers, it acts in preventing uterine and breast cancer, postpartum hemorrhages, cardiovascular diseases and the recovery of pre-gestational weight, in addition to avoiding osteoporosis.[3]

However, many infants are weaned before the recommended period – exclusively up to 6 months and kept up to 2 years.[4] Nipple trauma incidence has been demonstrated in more than half of the mothers in the puerperal period.[5] Discomfort generated by nipple trauma is one of the main causes of breastfeeding abandonment, which usually occurs in the first week postpartum, mainly due to inadequate latch on by newborns.[6]

Nipple trauma is characterized by the presence of changes in the nipple's skin, which may be associated with changes in skin tissue color and/or thickness, or the presence of continuity solution, and may be classified as primary elementary injuries (erythema, ecchymosis, hematoma, vesicle and blister) or secondary (edema, fissure, erosion, abrasion and ulceration).[7]

About 58% of postpartum women develop nipple-areolar injury, which represents a high incidence. This type of trauma persists, on average, for seven days after delivery, and its tissue repair time varies. Depending on its extent and severity, it can last from one to two weeks.[8]

In view of this scenario, it is necessary to gather in a single study different types of interventions based on scientific evidence that show efficacy for treating nipple trauma, including, among them, conduct updates, in order to assist health professionals in the proper management and reduce the rate of early weaning for this reason.

Thus, this study aimed to identify interventions based on effective scientific evidence for treating nipple trauma due to breastfeeding. Effective interventions were considered those that found a positive outcome for tissue repair and/or pain.

Methods

The present study is a systematic review conducted with its own elaboration protocol, di-

rected through the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).[9] Intervention studies, without language restriction and without time frame, available in full text and not addressing nipple trauma not related to breastfeeding, were established as eligibility criteria.

The guide question followed the PICO strategy (population, intervention, comparison and outcome.[9] The population consisted of lactating women. The interventions were actions for treating nipple trauma, compared to different controls. The outcome was improved tissue repair and/or nipple pain. Thus, the question is: What are the effective interventions for treating nipple trauma due to breastfeeding?

The searches were carried out from August to September 2020, through the Coordination for the Improvement of Higher Education Personnel (CAPES – *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*) platform, by the login of the *Universidade Federal do Rio Grande do Norte* (UFRN), to detect a larger collection of studies, including articles assigned to the university. The databases used were: Medical Literature Analysis and Retrieval System On-line/National Library of Medicine (MEDLINE®/PubMed®), Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Science, Cochrane and Latin American and Caribbean Literature in Health Sciences (LILACS).

The descriptors used were selected from the Descriptors in Health Sciences/Medical Subject Headings (DeCC/MeSH) in English and Portuguese: nipple* AND wound and injuries OR trauma AND therapeutic OR treatment AND breastfeeding (*Mamilo** AND *ferida* AND *lesões* OR *trauma* AND terapêutica OR *tratamento* AND *amamentação*). Each database presented a different search strategy due to filters. In MEDLINE®/PubMed®, free full text, comparative study, clinical trial, controlled clinical trial, randomized controlled trial, teen (13-18 years), adult (19+ years) and female filters were used. In Cochrane, the trials filter was used. At Scopus, the open access filter was used. On the Web of Science, open access and article filters were used. In CINAHL, the full-text filter was used. In LILACS, no filters were used.

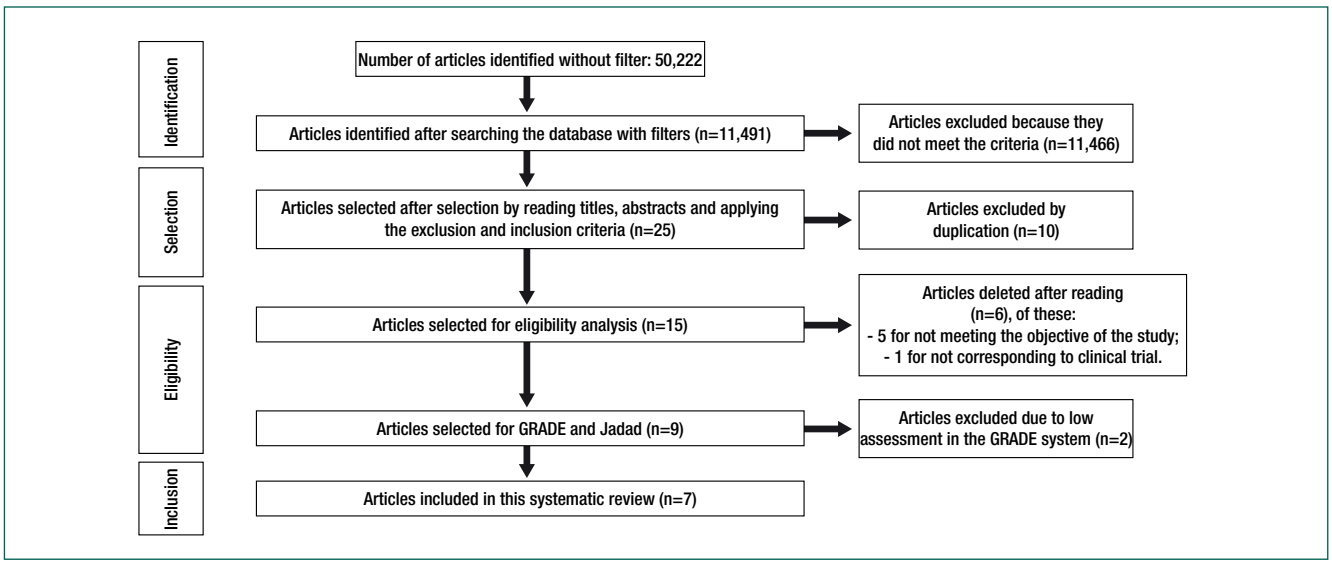
Assessment of studies was performed by two independent evaluators, who applied the same descriptors and filters, performing screening based on title, abstract and full text. In the event of any divergences, a third evaluator was consulted. The quality of the trials was assessed by the Jadad scale [10], and study reliability, by the Grading of Recommendations Assessment, Development and Evaluation (GRADE). Studies with low degree of certainty were excluded. [11]

Screening was carried out by reading titles and abstracts. Then, the studies were selected from the full reading of articles. The data collected during the search process were stored in a spreadsheet of its own elaboration.

At the end of the search without filters in all selected databases, 50,222 articles were identified. After applying the filters, 11,491 articles were found (501 from MEDLINE®/PubMed®, nine from Scopus, 6,182 from CINAHL, 3,521 from the Web of Science, 20 from Cochrane and 1,258 from LILACS). After reading titles and abstracts, 25 articles were selected. After exclusion by duplicity and critical analysis with complete reading of texts, there were seven articles left (three from Scopus, three from the Web of Science and one from CINAHL). The flowchart of the eligibility process was shown in figure 1.

The data from the selected articles were extracted, inserted and organized in a worksheet of own construction with description of identification (base, period, country and authors), methodological characteristics (type of intervention, control group and intervention group, research design, follow-up period and sample) and main results. Data were presented in the form of tables and descriptive statistics were performed, using absolute and relative frequency.

Results



GRADE - Grading of Recommendations Assessment, Development and Evaluation

Figure 1. Evidence selection flowchart based on Preferred Reporting Items for Systematic Reviews and Meta-Analyse (PRISMA)

Chart 1. Assessment through the Grading of Recommendations Assessment, Development and Evaluation of studies

Design	Risks of bias	Inconsistency	Indirect evidence	Inaccuracy	Certainty	Importance
Study 1: Nayeri et al.[12]						
Triple-blind clinical trial	Non-severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Critical
Study 2: Jackson et al.[13]						
Simple randomized blind trial	Very severe*	Severe*	Non-severe	Very severe*	⊕⊕◯◯ Low	Important
Study 3: Mariani Neto et al.[14]						
Randomized clinical trial	Non-severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Critical
Study 4: Coca et al.[15]						
Experimental study	Severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Important
Study 5: Abou-Dakn et al.[16]						
Blind simple controlled clinical trial	Non-severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Critical
Study 6: Coca et al.[17]						
Triple-blind randomized clinical trial	Non-severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Critical
Study 7: Firouzabadi et al.[18]						
Randomized clinical trial	Non-severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Critical
Study 8: Abdoli et al.[19]						
Randomized clinical trial	Non-severe	Non-severe	Non-severe	Non-severe	⊕⊕⊕⊕ High	Critical
Study 9: Brent et al.[20]						
Randomized clinical trial	Severe†	Severe†	Non-severe†	Severe†	⊕⊕◯◯ Low	Important

*Presence of confounding factors, researchers without direct control over interventions and considerable losses in follow-up; † presence of confounding factors, unclear inclusion/exclusion criteria, small sample and subjective outcome measurement

After reading the articles in full, nine studies were selected. Their assessment by the GRADE scale is demonstrated in chart 1.

Studies 2[13] and 9[20] were excluded because they presented low degree of certainty in the GRADE. Study 2 compared lanolin with usual care (breastfeeding education by a lactation consultant). However, interventions such as the use of hot and cold compresses, drug analgesia, dry air and the use of nipple plugs were accepted in the control group, which can be considered as a potential generator of confusion in the interpretation of results.[13] Moreover, women

Chart 2. Jadad assessment of studies

Jadad assessment	Study 1 - Nayeri et al. [12]	Study 2 - Jackson et al. [13]	Study 3 - Mariani Neto et al. [14]	Study 4 - Coca et al. [15]	Study 5 - Abou-Dakn et al. [16]	Study 6 - Coca et al. [17]	Study 7 - Firouzabadi et al. [18]	Study 8 - Abdoli et al. [19]	Study 9 - Brent et al. [20]
Was the study described as randomized?	1	1	1	1	0	1	1	1	1
Has randomization been described and is it adequate?	1	1	1	1	0	1	1	1	1
Was the study described as double blind?	1	0	0	0	0	1	0	1	1
Has blinding been described and is it appropriate?	1	1	0	0	1	1	0	1	1
Have the losses and exclusions been described?	1	1	1	1	1	1	1	1	1
Total	5	4	3	3	2	5	3	5	5

≥3: lower risk of bias; < 3: high risk of bias

in the control group and researchers were not blinded. The women were followed up by telephone, as they followed community care after hospital discharge. Thus, the researchers had no direct control over the non-use of lanolin by the control group. In the text itself it is mentioned that 12% of the control group used lanolin after four days of randomization, 16% used lanolin at some point after 12 weeks of follow-up, 11% used it every feeding, and 5% used it after 75% of breastfeeding. In the intervention group, 21% of women used lanolin only after 50% of feedings or less. The authors do not mention the exclusion of these participants. Therefore, the result found was considered as low certainty.

Regarding study 9,[20] in addition to having been performed with a small sample (n=21), there was a considerable amount of discontinuation, representing more than 30% of the sample. Moreover, the association with breast milk in both groups may have generated confusion, and therefore the study was considered as low certainty.

The Jadad assessment is shown in chart 2.

Study 5,[16] despite the score 2 on the Jadad scale, remained in the sample because it had a high degree of certainty in the GRADE. Although this study did not meet the criteria to assert itself as a randomized trial, which led to a low score on the Jadad scale, the allocation of participants between groups was made according to the day of the first report of pain, whether on even or odd days. Additionally, the study met other methodological criteria, such as intention-to-treat analysis and inclusion of risk reduction and adverse effects. For these reasons, it was considered of high certainty.[16]

After verifying the quality of the articles, seven of them were selected, of which 42.85% were produced in Brazil, 42.85% in Iran and 14.3% in Germany. Regarding the year of publication of these articles, 71.4% were published between 2016 and 2020, 14.3% in 2011, and 14.3% in 2008. The databases with the highest number of publications were Web of Science and Scopus, with 42.85% of articles selected in each of them, and CINAHL, with 14.3%. The types of effective interventions found involved application of chamomile ointment, use of highly purified lanolin, photobiomodulation with low-level laser, honey, millefeuille and breast milk, targeting any types of nipple-areolar injuries, as shown in chart 3.

Studies looking at the use of lanolin reiterated that the substance had statistically significant efficacy in pain relief and tissue repair during treatment.[14-16] Within the conditions evaluated in each study, chamomile ointment, photobiomodulation with low power laser, millefeuille (sachet of millefeuille tea applied directly to the nipple and areola and the tea to wash the breasts), breast milk and honey have also been shown to be effective for the evaluated outcomes, as detailed in Chart 3.[12,17-19] It is noteworthy that the study that investigated the use of photobiomodulation with low-power laser[17] and what compared millefeuille, honey, and breast milk[18] found no statistical differences between groups, despite finding better intragroup outcomes. The selected studies associated some substance with instructions to the mother, showing that breastfeeding and correct latch on were part of treatment and essential for comprehensive care.

Discussion

The main contribution of this review is the collection of interventions evaluated as effective for treat-

Chart 3. Characteristics of selected articles

Control group	Intervention group	Follow-up	Results	Comments
Study 1: Nayeri et al.[12]				
53 subjects used lanolin ointment (20g tubes) 1g, 3 times/day in areola and nipple + observation of breastfeeding and guidance on the correct latch on. The women evaluated were between 3 and 7 days postpartum	53 subjects used chamomile ointment 1.5%, 1g, 3 times/day in areola and nipple + observation of breastfeeding and guidance on correct latch on. The women assessed were between 3 and 7 days postpartum	3 and 7 days	Pain assessment by the Visual Analogue Scale showed significantly less pain in the intervention group on the 3rd ($p<0.001$) and 7th day ($p<0.001$). Symptom assessment by the Storr scale showed significantly less severity in the intervention group on the 3rd ($p<0.001$) and 7th day ($p=0.041$)	Chamomile was more effective in reducing pain and symptoms
Study 3: Mariani Neto et al.[14]				
90 women used breast milk at the end of each feeding, applying a thin layer of breast milk to the site of pain and nipple trauma, waiting to dry naturally +guidelines on the positioning of the baby and proper latching on to the nipple-areola region + guidelines on washing the breasts and bra daily with water and neutral soap and not using additional care. Women were still included in the maternity ward, but the exact period of recruitment of participants after childbirth was not specified	90 women used highly purified lanolin (Lansinoh Laboratories, Inc) applying a thin layer to the painful and traumatized nipple area, waiting to dry naturally + guidelines on positioning the baby and proper latching on to the nipple-areola region during breastfeeding + guidelines on washing the breasts and bra daily with water and neutral soap and not using additional care. Women were still included in the maternity ward, but the exact period of recruitment of participants after childbirth was not specified	2 and 7 days	Pain assessment by the numeric and verbal pain assessment scale showed significantly less pain in the intervention group ($p<0.001$). Nipple trauma assessment by the Nipple Trauma Score showed significantly less severity in the intervention group on the 2nd day ($p=0.667$) and 7th day ($p=0.025$)	Lanolin was more effective in reducing pain and improving the score of nipple-areolar injuries
Study 4: Coca et al.[15]				
26 women received guidance on positioning and correct latch on + guidance on the use of breast milk before and after breastfeeding at the site of injury. Women were recruited while still in the maternity ward, but the exact postpartum period was not specified.	24 women made topical use of anhydrous lanolin ointment by applying a thin layer on the nipple region and the injury, awaiting natural drying + guidance on positioning and correct latch on. Women were recruited still in the maternity ward, but the exact postpartum period was not specified	24 hours	Nipple-areolar injury assessment was performed by measuring the injury size, which showed a significantly greater decrease in the injury in the intervention group ($p<0.001$)	Lanolin was more effective in decreasing the size of nipple-areolar injuries
Study 5: Abou-Dakn et al.[16]				
39 women used breast milk, expressing and massaging the breast, applying drops of milk after each feeding, letting it dry naturally + guidelines on hand hygiene with soap and water before breastfeeding, correct breastfeeding practices and not using additional care. The postpartum period was not specified	45 women covered the areola with approximately 0.25g of highly purified lanolin on the nipple and areola, allowing it to dry naturally + guidelines on hand hygiene before breastfeeding, correct breastfeeding practices and not using additional care. The postpartum period was not specified	3, 7 and 14 days	Pain assessment by the Visual Analogue Scale showed significantly less pain in the intervention group on the 3rd ($p=0.00$), 7th ($p=0.03$) and 14th days ($p=0.04$). Nipple-areolar injury assessment by photographs and classification by Nipple Trauma Score showed significantly less severity in the intervention group on the 3rd ($p=0.00$) and 7th days ($p=0.00$). On the 14th day, there was no difference ($p=0.16$)	Lanolin was more effective in reducing pain and accelerating tissue repair of nipple-areolar injuries after 3 and 7 days of intervention
Study 6: Coca et al.[17]				
29 women received 3 sessions of laser light irradiation in the powerless red spectrum (placebo) + guidance on proper position, correct latch on and breast care. Women were assessed during the first hours postpartum until hospital discharge	30 women received 3 sessions of low power laser therapy emitting continuous visible red light (660 nanometers) with an InGaAlP semiconductor and 40 milliwatts of power (action site size 4mm^2), adjusted to an energy density of 5 Joules per cm^2 in 5 seconds (0.2 Joules per site). There was emission in 3 points (0.6 Joules in total), in the center of the injury, the right and left extremities + guidance on proper position, correct latch on and breast care. Women were assessed during the first hours postpartum until hospital discharge	0, 24 and 48 hours	Pain assessment by the Visual Analogue Scale showed pain reduction in the intervention group, with statistical significance after the second intervention ($p = 0.016$). After the first ($p = 0.050$) and the third intervention ($p = 0.392$), the results were not statistically significant. There was no statistical difference between groups after the third intervention	Photobiomodulation with low-power laser was more effective in the intragroup in reducing pain after 24 hours of intervention
Study 7: Firouzabadi et al.[18]				
50 women used drops of breast milk 2 times/day after the end of breastfeeding 50 women coated the nipple with mountain honey, twice a day, after the end of breastfeeding 50 women washed their breasts with boiled millefeuille (30g + 1L water for 10 minutes) 2 times a day, after the end of breastfeeding All of them received advice on the correct breastfeeding technique. The postpartum period was not specified		1, 3 and 7 days	Symptom assessment by the Storr scale showed significantly less severity in the 3 groups over time (1, 3 and 7 days), with $p<0.001$ in each group. In the assessment between groups, there was no difference at any time	There was no difference in efficacy between the 3 interventions for improvement of pain-related symptoms and cracked nipple[18]
Study 8: Abdoli et al.[19]				
40 women used breast milk on the nipple and areola after breastfeeding at least 4 times a day and letting it dry naturally + teaching the correct method of breastfeeding and distributing educational pamphlets. The postpartum period was not specified	40 women made topical use of a sachet of *Achillea millefolium* (millefeuille) tea, previously soaked in hot water, applied to the nipple and areola for 15 minutes, letting it dry naturally, at least 4 times a day + teaching the correct method of breastfeeding and distribution of educational pamphlets. The postpartum period was not specified	4, 8 and 14 days	Cracked nipple assessment by the Storr scale showed significantly less severity in the intervention group on the 4th ($p<0.01$), 8th ($p<0.001$) and 14th days ($p<0.001$). Pain assessment by the Visual Pain Scale showed significantly less pain in the intervention group on the 4th ($p<0.001$), 8th ($p<0.001$) and 14th days ($p<0.001$)	Millefeuille was more effective in reducing pain and lessening injuries.

ing nipple-areolar injury in lactating women. The summarized description of this care contributes to clinical practice by facilitating quick access to professional information for decision-making. The listed treatment strategies involve lanolin, chamomile ointment, honey, *Achillea millefolium* (millefeuille), and low-power laser photobiomodulation.

Breast milk, although widely used as a control, was also an effective intervention in one of the studies, which is characterized as a clinical trial with three groups, showing the analysis between them.[18,20]

It is essential to emphasize that topical therapies are adjuvant. The ability to assess the mother-child dyad in the investigation of the probable cause of injuries, paying attention to strategies that alleviate or worsen the mother's pain, and teaching the breastfeeding technique and other care that may interfere with pain reduction and tissue repair must be present concomitantly with the prescription of treatments.

Another important point is the variety of methods to assess pain and tissue repair of nipple wounds. Regarding pain, most of the sample used the Visual Analogue Scale (VAS. These findings corroborate a systematic review, which also adds the Descriptive and Short-Form McGill Pain Questionnaire (SF-MPQ), Verbal Rating Scale (VRS), 1–5 Verbal Descriptor Scale (VDS), Numeric Rating Scale (NRS) and Nipple Tenderness Scale.[21]

To assess tissue repair, most studies presented the Nipple Trauma Score (NTS), followed by the Storr scale. One study measured the injuries with a magnifying glass and a measuring tape. The NTS is based on the injury depth and extent, grading the nipple-areolar injury into six categories, while the Storr scale presents 5 degrees.[22,23] Another categorization subdivides the nipple traumas from injury length into mild, if from 1mm to 2mm, into moderate, if from 2mm to 9mm, and into severe, if from 10mm or greater and/or with yellow color.[24]

Lanolin has been shown to be an effective conduct in demonstrating reduction of injuries, improvement of pain and reduction in the incidence of new injuries, when compared to the controls mentioned in the studies.[14-16]Lanolin is a substance that has been studied over the years for treating nipple-areolar injuries as well as for their prevention. A recent clinical trial evaluated the use of lanolin associated with health education to prevent nipple-areolar injuries. However, there was no statistical difference that reinforced its use in a preventive manner.[25] More studies are needed to better delimit its indications for use.

Chamomile ointment showed greater efficacy in reducing the intensity of nipple pain compared to lanolin ointment.[12] Despite this, literature lacks current evidence regarding this herb, which is cited as a popular practice in treating nipple fissures, however, in the form of tea, not ointment.[26]

The topical use of yarrow tea sachet resulted in a significant improvement in the reduction of injury and pain, when compared to the use of breast milk.[19] However, another study showed an important regression of cleft severity, both for boiled millefeuille and for breast milk and honey. This fact signaled the possibility of developing anti-breast fissure creams based on these compounds.[18]

Highlighting the benefits of yarrow, topical use also demonstrated anti-inflammatory activity confirmed in *in vivo* assessment, with benefits for skin pH and hydration, for skin inflammations in general, which reinforces the effectiveness of its use.[27]

Breast milk, in other studies, showed divergent findings: the increase in injuries after 24 hours and statistically less favorable results.[14,15,19] This is, however, an alternative favorable to maintaining injury moisture and tissue repair, in addition to having no costs.[28]

It stands out as the most innovative in the literature on the subject of photobiomodulation with low-power laser, which reduced pain in the study included in the sample. It is a relatively low-cost alternative with promising potential in accelerating the process of tissue repair of injuries in infants and pain relief, which allows continuity of breastfeeding.[17,29]

The application of photobiomodulation with low-power laser has been shown to be considerably effective as an anti-inflammatory and active in tissue repair of wounds.[30] Photobiomodulation therapy with low-power laser can be performed by

two modalities: local laser therapy and intravascular laser irradiation of blood (transcutaneous laser administration).[31] In Brazil, the Federal Nursing Council (COFEN), through Resolution 567/2018, recognizes the potential of this technology by regulating its use by nurses.[32]

When assessing factors associated with nipple trauma, a cross-sectional study found that 80.8% of mothers were not instructed about breastfeeding during prenatal care. Even with seven or more consultations, 22 mothers had nipple-areolar injuries.[7] Breastfeeding education, focusing on the appropriate technique, should be routinely performed during prenatal and postpartum care, from the first feeding,[33] reinforcing the guidance to breastfeeding mothers about breastfeeding and ways to treat and avoid the appearance of injuries.[7] Guidelines on the correct latch on and positioning are shown to be protective factors against nipple trauma.[34]

This research appears as a subsidy to update health professionals regarding the effective alternatives for treating nipple injuries, which can be used to accelerate tissue repair and reduce pain.

As a limitation, there is the identification of little variety of interventions. It is believed that the absence of the descriptor "fissures" in the search may have been a limiting factor. It is observed that the studies differ in the nomenclature of nipple traumas resulting from breastfeeding. The term "nipple trauma" was chosen because it is broader than a fissure, although the latter is more popularly used. Furthermore, the use of filters for free access to full-text articles is shown to be a limitation that may have interfered with the number of articles found, although the accesses were made via UFRN login on the CAPES platform, which expands the number of articles available in full.

For future research, it is suggested to carry out other comparative clinical trials of the use of lanolin ointment and alternative methods, such as tea and chamomile ointment, as well as new comparisons between honey, breast milk and millefeuille. It is also essential to carry out interventions that associate topical treatments with low-power laser photobiomodulation, for the purpose of directing and standardizing therapeutic approaches.

Still, because these are different interventions and measurements of the outcomes, it was not possible to perform a meta-analysis in this study.

Conclusion

The effective interventions identified in the study involved chamomile ointment, highly purified lanolin, low-power laser photobiomodulation, honey, breast milk, and millefeuille. It is noteworthy that each intervention found was used in specific situations and in specific ways; therefore, the decision to use should consider all this information (form of presentation, concentration, frequency of use, type of injury, postpartum period, among others). Further studies are needed to create protocols for the use of each substance. The guidelines appear as a fundamental strategy associated with the therapies presented. This fact demonstrates that the training of professionals is essential to help puerperal women and an important part of treating injuries. Thus, it appears that the methods shown contribute to reduce the difficulties presented by breastfeeding mothers, improve pain reduction and tissue repair of injuries.

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